

## **Is safety a value proposition?**

The case of fire inspection

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# RESER

European Association for  
Research on Services

## 27<sup>TH</sup> RESER CONFERENCE BILBAO ■ SEP 7-9 ■ 2017

The Crucial Role of Services in Business and Cities Competitiveness

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## 27th Annual RESER Conference, 2017

**Title:** *The crucial role of services in business and cities competitiveness*

**September 7-9, 2017, Bilbao, Spain**

**Organised by Business Faculty, Mondragon University**

The RESER 2017 conference aim has been to capture frontier thinking in service research and to set a new research agenda to make sense of the full picture of economies and society as complex networks and systems of services. More specifically the conference opened a reflection on **the crucial role of services in business and cities competitiveness**.

Special attention was paid to the servitization issue that is changing the business models of a plethora of industries around the world. The Basque Country is one of the leading regions in industrial development in Europe and now is facing with successful results the so called, industry 4.0 challenge which is generating great interest about the crucial role of services in this strategy.

The Conference has been structured in 7 topics: City Service, Servitization, Service ecosystems, Service innovation, International Perspectives, Value creation and methodological challenges in service studies: complexity, pluralism and interdisciplinary. Furthermore, we addressed a *Special track* on Services and Development in Developing Countries (REDLAS) and another one related to European Industrial Services Projects.

RESER 2017 welcomed 3 keynote speakers: Andreas Schroeder (Advanced Service Group - Aston Business School, Norman Rose (EBRST) and Nanno Mulder (REDLAS); and two special sessions: The strategy of KIBS development in the city of Bilbao and the Servitization strategy developed by [Mondragon Corporation](#), the sixth biggest business group in Spain.

This Conference provided an excellent opportunity to bring together researchers from different countries and backgrounds to create new networks and to foster relationships amongst the RESER – service research community.

The chairs of the Conference thank to all participants for their excellent contributions, which you can see in the following pages of these proceedings.

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## A CONCEPTUAL PRICE MODEL FOR SMART CITIES

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*Smart Cities can collect and publish – through the different digital services offered – data and information, which are usually freely available for individual as well as for companies. However, smart cities should consider the possibility to sell these data and information, especially when other subjects can use them in order to make profit. The following is a working paper that aims to propose a conceptual model able to determine the variables that should be taken into account in order to define if and how much someone is willing to pay for getting those data and information made by smart cities through the use of digital platforms.*

### 1. Introduction

Recently the Economist (march, 2017) titled “*The world's most valuable resource is no longer oil, but data*”.

Nowadays, in fact, Governments are discovering new challenges and opportunities due to the explosive growth of new Internet technologies (e.g., mobile applications, smartphones, and cloud-based services) together with the Internet of Things (i.e., the possibility to connect different devices through radio-frequency identification and sensors) and the use of digital platforms (which are changing disruptively the way to collect and sell data).

Thus, a number of cities all over the world are implementing *Smart City Projects*, supporting the diffusion of the so-called “smart technologies” and trying to follow “smart” urban development paths.

Despite the lack of a unique definition, a Smart City can be generally defined as a city that aims to increase the quality and efficiency of the urban services offered to the citizens, while reducing the operational costs and the resource consumption. This is possible through the integration between and use of information and communica-

<sup>1</sup> Disclaimer: what stated in this paper do not represent the points of view of KPMG and are expressed as personal by the author.

tion technology (ICT) and Internet of things (IoT) technology (i.e., through the use of sensors integrated with real-time monitoring systems), which allows collecting a huge amount of data concerning city inhabitants (encompassing residents, workers and visitors/tourists), transforming this data in valuable information (i.e., an important source of knowledge for individuals, firms, and institutions).

These data and information – collected and published through the different digital services offered by Smart Cities – are usually freely available, both for individual as well as for companies (Williams, 2017). This data availability with “no cost” is congruent with the assumptions at the base of the “*open data logic*” (i.e., data that anyone can access, use, or share). However, the data provider (i.e., the government) should reconsider the possibility to give its data “for free”, especially when other subjects can use them in order to make profit (Williams, 2017).

Make (a lot of) “money” through the repack and sell of users’ activity information is already one of the most used strategies for specific websites (as Google, Twitter, and Facebook) that aim to make auxiliary revenue (Lambrecht et al., 2014). Moreover, there are a lot of market research firms specialized in the production (i.e., collection, process, packaging, and interpretation) and sales of market information, and many start-ups that are working to offer their digital services using different price models and marketing strategies.

Tim O’Really, in 2010, wrote a famous paper where he coined the term “Government as a platform” to explain the role of digital services as interfaces between government, citizens, and private companies.

This has created an “API Economy” (Application Programming Interface Economy) where many companies make revenues selling data and digital services, generating new marketing and price models.

Thus, *Why can governments not do the same and what can be the right price for data and digital services?*

This is especially true if we consider that a lot of open (i.e., free) government data are already used for profit by companies (e.g., companies that have free available access to Census Bureau data).

In the stream of research related to the market of information products, specific attention is devoted to the buyers’ willingness to pay for information because firms need to purchase information in order to improve their market knowledge and make better decisions (Jensen, 1991; Chen et al., 2001; Xiang and Sarvary, 2013).

However, the pricing of information, as well as the general pricing strategy followed by a company, is not easy to be determined and it can be influenced by numerous factors (Kienzler and Kowalkowski, 2017). In fact, one of the more critical, crucial, and high complex decisions facing by a company is to decide what price customers have to pay for their products and/or services (Gijsbrechts, 1993; Morris, 1987).

Consequently, there are a variety of ways in which cities could design the access – and the related cost for the access – to their data. In particular, as stated by Shapiro and Varian (1998), in their book “*Information rules: a strategic guide to the network economy*”, and according to the Pigou’s price discrimination classification (1932), there are three kinds of possible differential pricing: 1) *Personalized Pricing* (i.e., each user will have a different purchase price); 2) *Versioning* (i.e., users can choose

the version of the product most appropriate for their needs); 3) *Group Pricing* (i.e., different groups of customers will have a different purchase price).

As stated above, private companies already apply these strategies, whilst the government continue to operate under a “no-price” assumption.

In this respect, it is worth noting that there are no empirical studies regarding the pricing of the information produced by smart cities. Thus, the main aim of this paper is to fill this gap by proposing a conceptual model able to determine the variables that should be taken into account in order to define *if* and *how much* someone is willing to pay for getting that information.

In this vein, this study has the potential to bring important implications both for researchers and practitioners, showing the positive effects generated by the adoption of a pricing model to sell information also for governments.

After this Introduction, the paper is structured as follow. The second section is devoted to the analysis of the main theoretical aspects. According to the latter, the third section provide a description of the conceptual model on which governments could base their pricing decision. The fourth and final section is devoted to the discussion and conclusions, together with limitations and future research directions.

## 2. Main Theoretical Aspects

In the following sub-paragraphs the main theoretical concepts will be specifically addressed. In particular, a general overview of the Smart City concept will be provided, together with its main characteristics. The second sub-paragraph is devoted to the analysis of the digital platform and the Internet of Things (with a specific focus on the *Urban IoT*).

### 2.1. Smart Cities

Despite the increasing interest of both academics and practitioners (policy makers, especially), the concept of Smart City does still miss a unique definition (Albino et al., 2015; Lombardi et al., 2012; Mourshed et al., 2016; Zanella et al., 2014). Thus, from an academic literature point of view, it is possible to consider it as a topic in a “nascent stage”. This lack represents an important barrier to the possibility of *recognizing* a smart city, *measuring* the degree of its smartness as well as *defining* appropriate policies. However, all the efforts are in this direction. In fact, on the one hand, Scholars (e.g., Albino et al., 2015; Anttiroiko et al., 2014; Caragliu et al., 2009) are trying to analyse deeply the literature, looking for a general definition, together with measurement and common characteristics; on the other hand, also projects like “*The European Smart Cities*” (<http://www.smart-cities.eu>) are trying to define appropriate criteria to measure the “smartness” level of European cities (through the measurement of the city performance in 6 fields, namely: smart economy, smart mobility, smart environment, smart people, smart living, and smart governance).

Although there is no an exact definition of smart city, it is possible to identify its main aim. According to Zanella et al. (2014) and Consoli et al. (2017), the smart city pur-

pose is to improve the use of public resources, increasing the common problem-solving capability and the quality of the different services and infrastructures offered to the citizens by the Public Administrations – the Government, in general – generating an urban development at lower operational costs. In this scenario, an essential element is the achievement of these objectives through the use of ICT and other “smart technologies”, such as the Internet of Things (e.g., Dohler et al., 2011; Jin et al., 2014; Vlacheas et al., 2013) to overcome urban living challenges, like traffic, security, energy, and so on (e.g., Benner, 2003; Komninos, 2007; Giffinger et al., 2007; Caragliu et al., 2009; Lombardi et al., 2012).

## 2.2. Digital Platforms and *Urban IoT*

According to the above, a smart city main dimension is *Technology* (Angelidou, 2014; Nam and Pardo, 2011). In fact, through the use of new Internet technologies and the connectivity between different devices guaranteed by the Internet of Things (Walravens and Ballon, 2013), Governments are able to perform better their “*smart mission*”.

Thus, the design and development of a digital/e-service/online platform able to connect people, firms and institutions is of vital importance for cities in order to improve their economic growth (Lin and Edvinsson, 2010; van Eijk et al., 2015).

As well as for “Smart City”, even for “Digital platforms” there is no a unique definition (e.g., van Eijk et al., 2015), but both academics and practitioners are trying to identify its main characteristics (e.g., Allen and Florens, 2013; Brousseau and Pénard, 2007; EC, 2015; EP, 2015; Maxwell and Pénard, 2015). In general, it is possible to consider a digital platform as a particular *environment* to which multiple actors can connect to, interacting with each other, creating and exchanging value (Anttiroiko et al., 2013).

OECD (2010) has already recognized the role of these platforms, stressing their value – for both firms and customers – in terms of:

- *Cost reduction* (related to: transactions and search, as well as monetary benefits in general);
- *Relationships enhancements* (facilitating social communication and information exchange);
- *Better market processes* (improved convenience, greater choice, and higher engagements); and
- *Trust* (i.e., increased transparency).

For example, platforms commonly used by smart cities are the smart cards. This electronic card allows the owner to access to multiple e-services offered by government and at the same time, it allows to the government to access a set of data and information about citizens and their habits and preferences (Deakin and Al Waer, 2011). Governments usually use these data and information “*only*” to improve the quality and quantity of the services provided to their citizens, and not as a “*new way*” to increase their revenue (through which they could further increase the services they offer, generating a virtuous cycle, profitable for everyone).

Starting from this reasoning and going forward, it is possible *“to begin to think about cities not just as places, but as platforms”* (Bollier, 2016, p. 3).

In this vein, the application of the Internet of Things to an urban context (i.e., Urban IoT) is fundamental (Jin et al., 2014; Schaffers et al., 2011) for Smart City. In fact, as stated by Zanella et al. (2014): *“Urban IoTs [...] are designed to support the Smart City vision, which aims at exploiting the most advanced communication technologies to support added-value services for the administration of the city and for the citizens”* (p. 22). Examples in this sense are London, in the UK, and Santander, in Spain (Schaffers, 2011; Winkless, 2016) and their use of monitoring sensors (Boyle et al., 2013; Ghanem and Guo, 2012).

### **3. A model to sell information**

According to Manyika (2013), public information and shared data from private sources can help to create \$3 trillion a year of value in seven areas of the global economy. The amount of data collected will rise rapidly as cities build data portals and digital platform infrastructures are becoming "smarter". Digital platforms are already giving rise to thousands of information, businesses, in this way digital platforms can help companies to segment markets, define new products and services, and improve the efficiency and effectiveness of activities. In fact, a smart city is characterized by the possibility to generate and collect a huge number of information concerning citizens in the territory (Giovannella et al., 2013), in addition, digital platforms can be data management platforms, that collect information produced by most recent online operations, this is useful to segment market and customize services on citizen needs. All personal information such as identity, needs, preferences, habits can be sold and can be source of income for websites (Lambrecht et al., 2014) and digital platforms that supply information about users' activity to direct marketing companies. According to that, the need for a digital platform – able to support value creation processes and to create advantages into the competitive arena – has been enlarging from companies to territories and cities (Lin and Edvinsson, 2010). In this way, smart cities can generate income by selling digital content, brokering consumer data. Furthermore, smart cities could increase revenue by flexibly adjusting the amount of paid content they offer over time.

Therefore, information provided by smart cities has an important value and can give an important flue of knowledge, at all levels in terms of individual, firms, institutions. For example monitor consumer behaviour allows to create advantages into the competitive arena and to combine data with a variety of data sources, personal data, willingness to pay and geo-location has the potential to improve advertising effectiveness of the firms (Johnson et al., 2013), optimally targeting customers, and understanding the effect of ad content on customer behaviour.

Keeping in mind that firm which aims to generate online advertising revenues faces major challenges regarding measuring the effectiveness of advertising, optimally targeting customers, and understanding the effect of ad content on customer behaviour. Advertising effectiveness is difficult to measure both offline (Lewis and Reiley, 2013) and online (Lewis and Rao, 2013).

Firms need and ask information to make better decisions (Jensen 1991). Indeed, information about customers or citizens is typically associated with some level of uncertainty. Furthermore, information is typically used in a decision context where the target is to outperform a competitor. Without competition between the users of information the value of information comes from reduced uncertainty. When there is various information products offered on the market, buyers could combine these to arrive at a full view of the world, this is important to make better subsequent decisions (Admati and Pfleiderer, 1987). The statistical properties: reliability and correlatedness, determine the benefit of combining multiple pieces of information (Winkler, 1981). In the extreme case of perfectly accurate reports there is obviously no incentive to combine different information sources (Xiang and Sarvary, 2013).

Information providers compete on the statistical properties of their products: the accuracy and correlatedness of the information. The competitive price can be high when information products are not very reliable because of potential complementarity between them (Shapiro and Varian, 1998).

Lambrecht and Misra (2013) look at the trade off between content (subscription) and advertising. They also find that as a result of heterogeneity in willingness to pay over consumers and time, a static model may be not optimal. Due to the lack of studies addressing the value of information in smart cities (and generally in digital platforms marketplace), first of all, this work stands as a first at-tempt to bridge the gap in the current literature as well as to offer a useful instrument to practitioners.

Each enterprise needs detailed information about their consumers, this information from data produced by person, sensors, organizations present in the smart city value chain that use services on digital platforms. Thus, the main aim of this paper is to propose a conceptual model able to determine the variables that should be taken into account in order to define if and how much someone is willing to pay for getting information made by smart cities and digital platforms.

The model is focused on three variables:

1) *Who*, based on personal data, typically consisting of consumers' identities, habits, needs, and/or preferences (Lambrecht et al., 2014) willingness to pay, budget constraint, and their demographic (Xie et al., 2006) and psychographic attributes; individuals act as sellers of their personal information when they purchase goods with loyalty or credit cards, carry cell-phones, or purchase goods (Grossklags, 2007) and services. The "who" dimension has the capability to profile the customer which could be a citizen, a private firm or another organization. The more detailed the categories of customers are outlined, the more will be the value of the information and the capabilities to know how to fix the correct price. Accurate consumer personal information is one of the most strategic assets of a firm (Xie et al., 2006). Firms need accurate consumers' personal information. In this way, firms can effectively perform direct marketing, customer relationship management, and strategic production of goods and services (Henderson and Snyder, 1999; Long et al., 1999; Milne, 1997). Consumer personal information is important because Internet serves as a main distribution channel. According to Hoffman et al. (1999), the willingness of consumers in providing personal information is one of the most important determinants of the commercial development of the Web (Xie et al., 2006).

2) *Time and Timing*. *Time*, related both to the speed and accuracy with which information is provided (Shapiro and Varian, 1998). Accuracy is how close a measured



value is to the actual (true) value, in this case accuracy of a measurement process is usually established by repeatedly measuring some traceable reference standard speed, the fact or quality of being done or occurring at a favourable or useful time (Alison, 2016), the speed contribution to knowledge management in firms can be timely creation of knowledge, creating cognitive maps, multiplication of knowledge in time and space; creating extensive knowledge networks (Paniccia, 2006), therefore, more is the speed of the request of information, more it is the value of information. *Timing*, the value of the information also depends on the moment when the information is requested, the need to select the precise moment to ask an information, for doing something at the right moment for optimum effect, the right time to act, that is, when the knowledge of the events and their effects on the enterprise is at best (Paniccia, 2006).

3) *Frequency* (i.e., the number of times the information is required) to control who accesses how much data (Manyika, 2013), you could charge based on volume. And user payment tied to consumption levels will be standard practice for government services. You could charge based on volume. More is the request of information, more it is the value of the information. The frequency also determines the *queue* of requests to that information/digital service, representing also the demand of digital service in that particular slice of time. Higher is the number of requests, higher is going to be the value of that information in that moment.

Thus, the value of the information can be expressed as a function of these three variables.

$$V = f(W, T, F)$$

In this vein, this study has the potential to bring important implications both for researchers and practitioners, showing the positive effects generated by the adoption of a pricing model to sell information.

## 4. Discussion and Conclusions

Governments are discovering new challenges and opportunities due to the rising growth of new Internet technologies (e.g., mobile applications, smartphones, and cloud-based services) together with the Internet of Things and the use of application programming interfaces and digital platforms..

Smart Cities, through the integration between and use of information and communication technology (ICT), processes, data and Internet of things (IoT) technology, can increase the quality and efficiency of the urban services offered to the citizens, furthermore smart cities can collect a huge amount of data concerning city inhabitants (encompassing residents, workers and visitors/tourists) and local economy, and to transform this data in valuable information, which become an important source of knowledge at different levels (i.e., individual, firms, institutions, financial) and revenue. These data and information – collected and published through the different digital services offered in Smart Cities context– are generally free, but the data provider (i.e., the government) should reconsider the possibility to give its data “for free”, in

particular when other subjects can use them in order to make profit (Williams, 2017). Make (a lot of) “money” through the repack and sell of users' activity information is already one of the most used strategies for specific websites (valid examples in this sense are: Google, Twitter, Facebook, etc.) that aim to make auxiliary revenue (Lambrecht et al., 2014). Smart cities need to have a similar approach, they should take into consideration the specific attention devoted to the buyers' willingness to pay for information because firms need to purchase information in order to improve their market knowledge and make better decisions (Jensen, 1991; Chen et al., 2001; Xiang and Sarvary, 2013), we aim to fill this gap by proposing a conceptual model able to determine the variables that should be taken into account in order to define if and how much someone is willing to pay for getting that information.

In this vein, this study has the potential to bring important implications both for researchers and practitioners, showing the positive effects, for governments, generated by the adoption of a pricing model to sell information, generally applying the law of supply and demand also to digital information and services marketplace. Data – already collected, packed, enriched, reconfigured and held by administrations – can become a fundamental foundation for building digital services and sell this kind of information.

In fact, the conceptualized model proposed by this study can be useful to establish the value of the information according to three variables: 1) Who (based on availability to pay, budget constraint, and profile of the information buyer); 2) Time (related both to the speed and accuracy with which information is provided) and *Timing* (related to the moment when the information is requested); and, 3) Frequency (i.e., the number of times the information is required). Thus, the price of the information can be expressed as a function of these three variables.

Future research can start from this conceptual study and develop quantitative models to accurately determine how much and how each variable affects the information value/price.

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# A FRAMEWORK TO ASSESS THE LEVEL OF CUSTOMER CENTRICITY IN MANUFACTURING COMPANIES

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*As a direct result of changing market conditions, manufacturing companies are currently reorienting their efforts towards customer's needs, and shifting their focus from goods to services. In this context, it becomes more and more important for companies to adopt a customer centricity approach: a strategy that puts customer needs at the centre of all business processes and decisions. This work develops a framework to measure the degree of customer centricity in manufacturing companies.*

*Keywords: customer centricity; framework; customer oriented; customers' needs; product-service-systems*

## 1. Introduction

Markets are becoming extremely competitive and turbulent, and are steadily changing (Neu; Brown, 2005): market conditions are switching from simple and stable to complex and dynamic. In this context, manufacturing companies can no longer rely on the traditional product-focused business models, whose competitive dimensions are time, cost, quality or flexibility (Dimache; Roche, 2013). Indeed, market offerings have evolved towards complex system where the product is integrated with services, namely "product-service-systems" (PSS). PSSs have the potential to build durable relationships with customers, strengthen loyalty and increase the propensity to repurchase (Oliva; Kallenberg, 2003; Brax, 2005; Baines et al., 2009). Therefore, in order to provide solutions that better fit the needs of their customers, building new sustainable competitive advantages (Johnson; Selnes, 2004; Neely, 2008; Gebauer et al., 2011). Several manufacturing companies have modified their organizational structures, trying to become more aware and sensitive to customer needs, developing a new "customer centric approach" (Day, 2000; Gebauer et al., 2011).

The literature reports several examples of companies that successfully implemented a customer-centric strategy. For instance, Amazon (Fine, 2014) decided to develop most of its features based not on the opinion of the development teams but according to its customers' requests. In addition, Amazon adopted some practices to maintain a level of excellence in the customer experience (e.g. incentives and rewards). Furthermore, the e-commerce leader adopted a "culture of metrics" with the goal of measuring the customer reactions to the product characteristics and to the company web site design. As a consequence of this type of approach, Amazon got a series of benefits and its shares doubled their price.

Another company that adopted a customer centricity strategy is IBM, which introduced important changes affecting the business culture. The most important

outcomes were an improved customer satisfaction and company performance (Power; Stanton, 2015).

Furthermore, several studies show how the implementation of a greater customer focus can give to the company positive advantages: maximizing value of the best customers has the potential to increase sales by 17% (Fader, 2012); Bain & Company assume that increasing customer retention rates by 5% increases profits by 25% to 95% (Detrick; Reichheld, 2003); finally, a Deloitte & Touche report calculated that customer-centric companies are 60% more profitable than their competitors (NGDATA.com, 2015).

Although several experts recognize the importance of a customer-centric approach in today's competitive market, the literature shows the lack of methods and tools to support and evaluate the development of a customer centricity strategy, in particular in manufacturing companies traditionally focused on product design and production. Therefore, it is not surprising that, despite a growing number of manufacturing companies in B2B markets recognize the need to become more customer-centric, several studies report that few have really understood in practice how to develop such customer orientation (Galbraith, 2005; Shah et al., 2006; Gummesson, 2008). An example comes from a BCG study (Bartan, et al., 2016) that involves more than 90 companies: only in 20% of the cases analysed, customer insight plays a strategic role. Therefore, it is evident the most important business decisions do not still reflect customer insights.

Thus, in order to fill this gap, this paper aims to develop a new framework that (i) identifies the elements characterizing the customer centricity strategy in manufacturing companies and (ii) supports companies in the evaluation of the customer centricity maturity level. Moreover, by applying the framework in practice, this paper discusses how the proposed framework can support manufacturing companies, and particularly SMEs, in designing their customer centricity strategy and in consistently planning and deploying the actions needed to implement it.

The remainder of the paper is structured as follows. The next section provides a literature background on customer centricity concept and the frameworks from literature, the third section describes the research methodology, the fourth section reports the new customer centricity framework developed and the fifth the application to six case studies with the main results. Finally, the sixth section reports some guidelines for customer centricity implementation and the last section draws some concluding remarks.

## **2. Theoretical background**

### **2.1. Customer centricity concept**

Although customer centricity has only recently been embraced by the business community, this concept had already been studied and examined in the last century (Shah, et al., 2006). Only from the mid-1980s, however, the concept of customer centricity began to grow in importance in the scientific community, and several authors started reporting definitions with different facets of meaning.

Wernerfelt in 1984 stated that customer centricity helps companies and customers to co-create knowledge on needs and preferences. More recently, Matsuno and Mentzer (2000) added to this vision the importance of capturing and using

information about customer needs (Matsuno; Mentzer, 2000). Then, over the year, the customer centricity concept has evolved and has been seen as an opportunity for companies to create a competitive advantage based on increasing customer satisfaction (Shah, et al., 2006). Finally, in 2012 Fader defined customer centricity as a business strategy: “*Customer centricity is a strategy that aligns a company’s development and delivery of its products and services with the current and future needs of a select set of customers in order to maximize their long-term financial value*” (Fader, 2012). Loshin and Reifer (2013) give a further definition that clarifies the customer centricity goals: “*The customer centricity represents a set of strategies that places the customer at the centre of an organization’s operations [...] and intended to help companies to better understand who their customers are, what they want, and how they can best benefit symbiotically*”. Considering and blending all these definitions, we can define the customer centricity as a corporate approach capable of aligning the design, product and service development, and distribution with the customer needs, in order to build an enduring relationship and to improve the company performance.

Hence, customer centricity is based on the idea that customer needs “come first”, i.e. the company should put all its effort into troubleshooting its customers and creating a product of value for the customer itself. Following this line of reasoning, a customer centric company can therefore be seen as the one that integrates the customer experience program throughout its organization (Hayes, 2013): this integration has many forms, but the underlying idea is that the knowledge and importance of the client must be shared and communicated extensively throughout the company. This also means that customer centric companies use customer feedback and customer satisfaction metrics to build their decision-making and incentive their programs (Manning, et al., 2012).

## 2.2. The transition from a product to a customer-centric view

As presented in *Table 1:*, over the years, the customer centricity approach has been generally discussed and explained to the managerial community in comparison with the traditional product centricity approach (e.g. Galbraith, 2005; Shah, et al., 2006).

Business area	Product-centric approach	Customer-centric approach
Product design	Design restricted to personal experience and judgment, without exploring new approaches.	Products/Services are developed according to customer needs. Correspondence to the request is monitored along its lifecycle
	Products and services are expression of personal believes and skills.	Products characteristics are defined according to customer needs and preferences.
Information	Information comes from personal experiences and intuitions.	Import information on the market (customers, competitors, channels) are collected and used.
Communication language	Internal language and communication code.	The communication is tailored on the client
Interaction with the customers	May happen to take advantage of the client with pretentious offers.	The goal is to satisfy the client being transparent about the product/service.
Performance	If there are no claims, there are no problems.	The customers’ satisfaction is continuously monitored and, if necessary, corrective actions are implemented.
Customer intimacy	A superficial knowledge of the most relevant aspect is enough. It is not	It is important to get to know in depth the clients, their needs, their routing and their



Business area	Product-centric approach	Customer-centric approach
	necessary to update it frequently.	changes.

**Table 1: Comparison between product-centric approach and customer-centric approach (Galbraith, 2005; Shah, et al., 2006)**

The transition from a product centric approach to a customer centric one is very complex and requires a transformation process that covers all the organizational aspects of the company. Based on literature, we summarized some of the main challenges and related benefits in *Table 2*:

	Benefits of a customer-centric approach	Challenges to develop a customer-centric approach	References
<i>Strategy</i>	<ul style="list-style-type: none"> <li>- Development of trust relationships;</li> <li>- Customer relationship consolidation;</li> <li>- Better comprehension of customer needs;</li> <li>- More competitive advantages.</li> </ul>	<ul style="list-style-type: none"> <li>- Difficulties in developing an efficient collaboration with the client;</li> <li>- Cultural issues;</li> <li>- Necessity of specific training courses</li> <li>- Reorganization of the company structure</li> </ul>	Gumesson, 2008; Loshin; Reifer, 2013; Shah, et al., 2006; Galbraith, 2005.
<i>Marketing</i>	<ul style="list-style-type: none"> <li>- Increased customer experience</li> <li>- Increased customer loyalty;</li> <li>- Improvement in customer approach;</li> <li>- Improvement in customer relationship management;</li> <li>- A better knowledge of the client allows to offer the right product in the right moment.</li> </ul>	<ul style="list-style-type: none"> <li>- Issues in developing collaborations with clients;</li> <li>- Difficulties in collecting data;</li> <li>- Necessity of a new approach to collect information.</li> </ul>	Loshin; Reifer, 2013; Shah, et al., 2006.
<i>Economics</i>	<ul style="list-style-type: none"> <li>- Performance improvement in terms of productivity, profit and market shares;</li> <li>- Measurement and optimization of performance</li> <li>- Easiness in data extraction for company indicators;</li> <li>- Decreased sensibility of clients to prices</li> </ul>	<ul style="list-style-type: none"> <li>- Necessity of specific investments according to customer needs;</li> <li>- Investments in training activities;</li> <li>- Issues in evaluating how the customer centricity impacts the single person performance;</li> <li>- Issues defining the KPI referred to external aspects as client satisfaction (qualitative and subjective measurements);</li> <li>- Need of tools to measure how the customer orientation affects the organization performance.</li> </ul>	Shah, et al., 2006; Gumesson, 2008; Loshin; Reifer, 2013.

**Table 2: Benefits and challenges for implementing customer centric approach**

### 3. Research process and method

As presented in *Fig. 1*., the research process consisted of two main activities: 1) the development of the customer centricity framework, based on the existing literature analysis, and 2) its empirical application, which allowed to both refine it and explore its managerial usefulness.

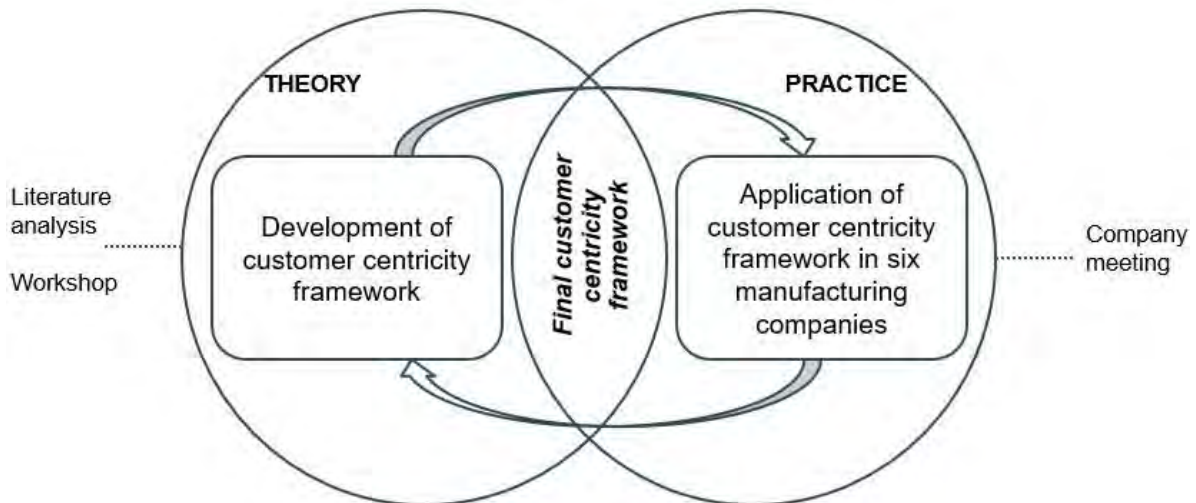


Fig. 1: The main activities of the research process

### 3.1. Conceptual development

In order to develop the framework proposed in this paper, we reviewed the literature related to the customer-centricity and related topics (such as customer experience and customer relationship management). To do that we borrowed an approach often used when relevant research is spread across a number of different literature streams (e.g. Rapaccini; Visintin, 2015). We started our analysis with recently published reviews in the marketing and operations management fields (e.g. Galbraith, 2005; Shah, et al., 2006; Lamberti, 2013; Loshin; Reifer, 2013). Then, the literature analysis was carried out analysing the most cited papers and evaluating their most relevant references.

Moreover, in order to gain a first insight into the current knowledge on the specific topic of this research, we scrutinized the literature to find out papers that propose or adopt a structured model for developing or evaluating the customer centrality. *Table 3*: reports the results of this search: seven contributions where find-out and deeply analysed.

Author(s)	Model Type	Contribution
<b>Galbraith (2005)</b>	The Customer-Centric Organization Model	Organization model that describes, using five dimensions and 13 variables, how to be a customer centric company making comparisons with a product centric one. The dimensions are: 1) Strategy (goal; main offering; value creation route; most important customer; priority-setting basis; pricing); 2) Structure (organizational concept); 3) Processes (most important process); 4) Rewards (measures); 5) People (approach to personnel; mental process; sales bias; culture).
<b>Sohrabi, et al. (2010)</b>	Customer Relationship Management Maturity Model	The model is composed of nine "Critical Factors" for the CRM analysis (Strategy, Technology, Process, People, Culture, Change Management, Structure, Knowledge Management, Measurement). Each factor is operationalized by a set of 22 items. Furthermore, each of them is evaluated through 6 levels of maturity.

Author(s)	Model Type	Contribution
<b>Hechtkopf (2011)</b>	Customer Centric framework	The model features seven survey areas: Organization readiness; Data; IT Support; Analytics Team; Marketing/Communication Team; Voice of the Customer; Execution/Fulfilment Readiness. Each area is articulated in 4 questions that, depending on the answer, get assigned a score from 1 to 5, where 1 indicates completely disagree and 5 indicated completely agree. Based on the total score obtained, the company can be assigned to one of the five different levels of customer centricity.
<b>Manning, et al. (2012)</b>	Customer Experience Management Model	The model provides a set of features that the company must have to be customer oriented. These features are grouped in 6 disciplines that must be deeply analysed and mastered from the customer experience leaders. The six disciplines are: strategy; understanding; design; measurement; governance; culture.
<b>Va-zifehdust, et al. (2012)</b>	Model for Customer Relationship Management implementation	The model is structured in 9 big groups of critical factors (38), that represents the different transformation areas to approach the customer relationship management.
<b>Hollander, et al. (2013)</b>	Customer Centric Maturity Model	The model is structured in ten organizational areas: (process; people; technology; brand and market position; customer segmentation; distributor management; propositions; service delivery; customer lifetime value management; culture), characterized by five stages of maturity (Undeveloped, Emerging, Developing, Advancing, Leading). The first level represents a company that is exclusively product oriented, while the fifth level a company whose structure and practices are entirely customer oriented.
<b>Burns (2016)</b>	The Customer Experience Management Maturity Model	The model includes 30 practices organized into six competencies of customer experience management: (1) customer understanding; (2) prioritization; (3) design; (4) delivery; (5) measurement; (6) culture. Each competence is composed of a set of practices that define the “current state” of the company regarding the customer experience management.

**Table 3: Literature frameworks for the study of customer orientation**

Through this literature review, a first version of the customer centricity framework was developed. The framework is structured in two levels: the *first level* consists of five dimensions that can accurately describe the organization; the *second level* specifies the first level dimensions through a specific set of variables.

Then, in order to supply an objective measure of the customer orientation of the company, the framework considers, for each variable of each dimension, three different levels of customer centricity. These levels allow a company to evaluate each business variable and give a macro-indication of its level of customer centricity, useful also for comparison with other organizations.

The three *customer centricity levels* are defined as follows:

- *High customer orientation*: the variable is configured according to the guidelines to implement and maintain a customer-centric approach;
- *Medium customer orientation*: the variable is based on a customer-centric approach but there are no specific actions for the implementation of a customer-centric structure;
- *Low customer orientation*: the variable is configured according to the

traditional product-centric model.

Then, each of these levels has been defined specifically for each variable of the framework.

### 3.2. Empirical application

The framework has been applied to six manufacturing companies, in order to test its comprehensiveness and managerial applicability.

*Table 4.*, provides a description of the company sample under analysis and shows their strategic targets to develop a customer centricity strategy involving all the company functions related to the customers.

Case	Description	Strategic objectives for developing customer centricity	Team
A	Large Italian company with 590 employees that specialized in the production of numerically controlled machining centres, thermoforming machines and waterjet cutting systems.	<ul style="list-style-type: none"> <li>▪ Disseminate a customer-oriented culture</li> <li>▪ Increase customer intimacy</li> <li>▪ Increase customer experience</li> </ul>	Managing Director; Service Manager; Marketing Manager; Commercial Manager; Marketing Manager
B	Medium Italian subsidiary of a big Swiss company, with 55 employees that provides machines and automation solutions to manufacturers of precision components.	<ul style="list-style-type: none"> <li>▪ Increase customer satisfaction</li> <li>▪ Increase and manage customer experience</li> <li>▪ Increase customer loyalty</li> </ul>	Managing Director; Service Manager; Marketing Manager
C	Medium Italian subsidiary of a big Austrian company, with 54 employees that produce machines tools.	<ul style="list-style-type: none"> <li>▪ Disseminate a customer-oriented culture</li> <li>▪ Implement practices to lead customer information</li> <li>▪ Manage customer experience</li> </ul>	Managing Director; Service Manager; Commercial Manager; Operation Manager
D	Large Italian company with 832 employees (group data) provider of advanced weaving solutions.	<ul style="list-style-type: none"> <li>▪ Increase customer intimacy</li> <li>▪ Understand and implement tools to manage customer information</li> </ul>	Service Manager; Marketing Manager
E	Small Italian subsidiary of a big German company, with 22 employees that lead fluid control systems.	<ul style="list-style-type: none"> <li>▪ Disseminate a customer-oriented culture</li> <li>▪ Increase Key Performance Index</li> <li>▪ Increase customer loyalty</li> </ul>	Managing Director; Service Manager; Commercial Manager
F	Medium Italian company that provide balancing machines for rotating components and process control systems for machine tools.	<ul style="list-style-type: none"> <li>▪ Increase customer intimacy</li> <li>▪ Implement practices to lead customer information</li> </ul>	Service Manager; Marketing Manager; Business process Manager

**Table 4:** Sample of analysis

In order to enhance the reliability and validity of the data collection and elaboration activities (Voss, et al., 2002), we designed a specific research protocol. Following the suggestion by Yin (2009), the developed protocol, summarized in *Fig. 2.*, is composed of five main steps, namely:

- *define and design*, where we analysed literature; defined the research objectives the sample of our analysis, and the main tools used for the collecting and analysing data;
- *data preparation*, where we built a database to map information from companies' interviews;
- *data collection*, that consist of a preliminary questionnaire and two series of interview in each company;
- *data analysis* both with a single case analysis and cross-case analysis;
- and, at last, *data elaboration* and benchmarking results and preparation of reports.

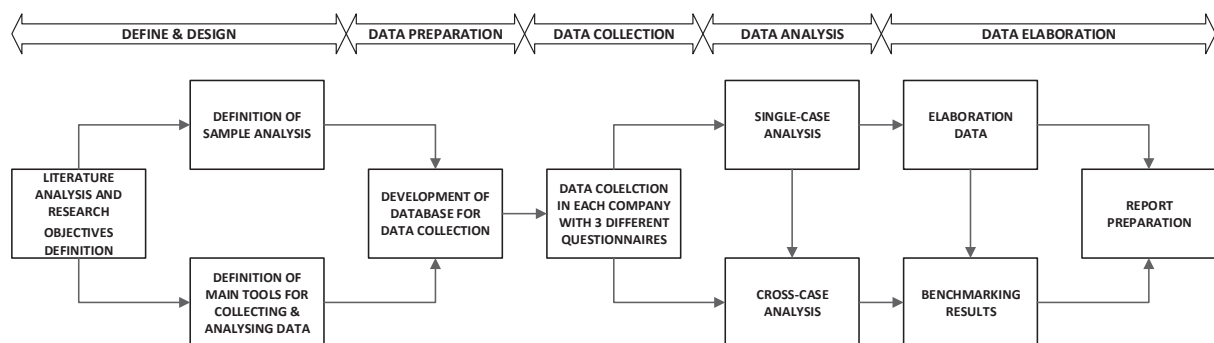


Fig. 2: Research protocol: main steps

Moreover, specific tools have been developed in order to support the *Data collection* step of the research. In particular:

- a preliminary questionnaire to gather useful information about the companies (corporate data; customer segmentation; product segmentation; services portfolio; business processes; and informative system).
- A second questionnaire, helpful in defining the area of analysis (selection of strategic customer segments for the company and its products) and the customer's lifecycle phases.
- A third questionnaire useful to map in detail each customer's lifecycle phase in terms of activities, involved resources, practices and tools for collecting, analysing, sharing and disseminating data, and indicators for measuring performance

## 4. Customer centricity framework

### 4.1. Customer centricity framework structure

Fig. 3: summarises the two-level hierarchical framework. In fact, as mentioned above, the proposed customer centricity framework is structured in two levels:

- *The first level* uses five dimensions that are commonly used in literature to describe the organization (Galbraith, 2005; Sohrabi, et al., 2010). These dimensions are: strategy, processes, resources, technologies and performance.
- *The second level* operationalize the first level dimensions through a set of 34 variables derived from literature that correspond to the most relevant aspects that need be characterized in order to describe and evaluate the customer centricity in manufacturing companies.

Additionally, model variables belonging to resources, processes, technologies, and performances dimensions are investigated along the different stages of the customer's lifecycle (Deloitte, 2012). This allows assessing the different phases of interaction with the customer

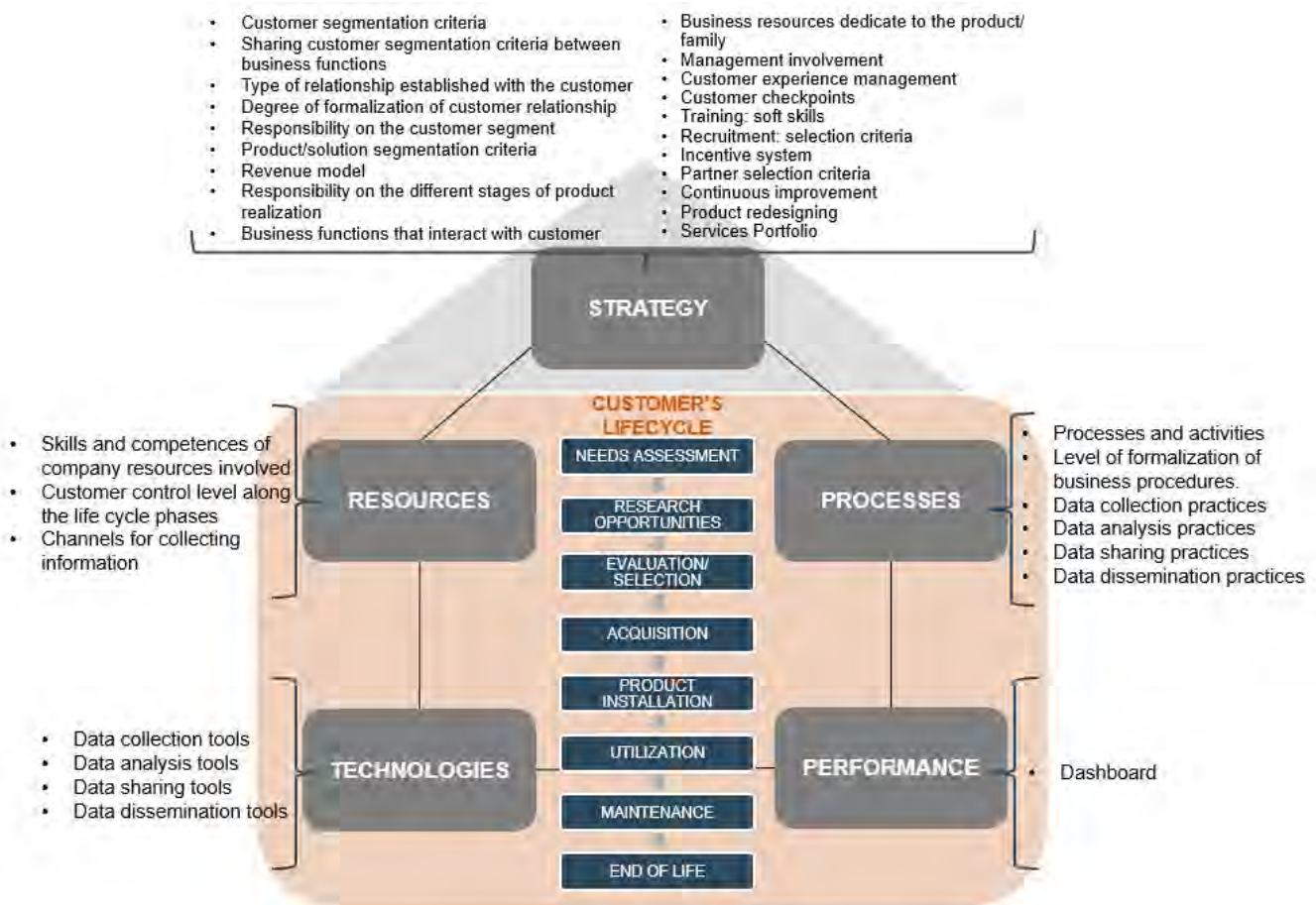


Fig. 3: Customer centricity framework

The customer's lifecycle phases have been identified from the literature and adapted to the context of our project. The main phases can be defined as follows:

- *Needs assessment*: phase in which the customer becomes aware of new needs, may be implicit or explicit.
- *Research*: phase in which the customer collects information aimed at identifying the product/solution that best suits his needs.

- Evaluation/ Selection: phase in which the customer evaluates different available offers and selects the one that best satisfies his needs.
- *Acquisition*: phase in which the customer completes the purchase of the product/solution.
- *Product Installation*: phase in which installation and commissioning take place.
- *Utilization*: phase in which the customer utilizes the product / solution to meet its own needs.
- *Maintenance*: phase in which the customer uses services in order to keep the product / solution meeting his needs.
- *End of life*: phase in which the customer rejects the product / solution as it no longer meets his needs.

## 4.2. Level I: Dimensions

The five dimensions of the model have been selected based on similar works found in the literature (see *Table 3*:), in order to cover all the organizational areas of a company, in the simplest and most complete way possible.

From the literature, it emerged that some models focus only on certain areas, neglecting other important ones. As an example, Burns, 2016, and Manning, et al. 2012, do not investigate aspects such as resources involved and the technologies to be used. Galbraith, 2005, proposes CRM to manage customer relations but does not deal with the technologies that can support the whole organization in a customer-orientated way; Hechtkopf, 2011, and Vazifehdust, et al., 2012, do not handle processes and procedures to be implemented in the company).

On the other hand, other authors propose many "areas of inquiry", that sometimes are not distinguishable and partially overlaps, making the model more complex (e.g. Sohrabi, et al., 2010; Hollander, et al., 2013).

For these reasons, five dimensions have been chosen to represent an organization as simply but as accurately as possible. These dimensions are:

1. **Strategy**: this dimension investigates the strategic choices that characterize an organization. In particular, all the aspects that define the strategic plan of a company are analysed (Galbraith, 2005; Sohrabi, et al., 2010; Manning, et al. 2012; Hollander, et al., 2013; Burns, 2016).
2. **Resources**: this dimension investigates all the resources that directly or indirectly interact with the customer and that result useful in collecting information. In addition, the level of customer control, the skills and competences of the resources involved in the interaction and the decision-making autonomy delegated to the frontline, are examined during the different phases of the customer's lifecycle (Galbraith, 2005; Sohrabi, et al., 2010; Hollander, et al., 2013).
3. **Processes**: this dimension explores the main activities and processes of the company. Also all the procedures, whether they are in a formalized form or not, leading business activities and customer interactions, and managing the information from customers are analysed (Galbraith, 2005; Sohrabi, et al., 2010; Hollander, et al., 2013).

4. **Technologies:** this dimension identifies all tools and information systems used by the company to collect customer information, analyse and streamline the data, share the results within the company itself and issue information to its customers (Sohrabi, et al., 2010; Hechtkopf, 2011; Vazifehdust, et al., 2012; Hollander, et al., 2013).
5. **Performance:** in this dimension, the performance indicators related to the customer's lifecycle and its specific phases are analysed (Galbraith, 2005; Sohrabi, et al., 2010; Manning, et al. 2012; Burns, 2016.).

### 4.3. Level II: variables

As mentioned above, each of the dimensions introduced has been operationalized through a set of variables derived from the literature, in order to evaluate the customer orientation of manufacturing companies.

To derive these variables, we first analysed the relevant elements addressed by the selected similar models (see *Table 3:*). At the same time, as a systematization of the current knowledge on the topic could not rely only on the sources adopting a model-based approach, we also searched for relevant literature that deals with each customer centricity and related topics, such as: customer experience, customer satisfaction, customer loyalty, customer retention, customer lifetime value, customer relationship management and, obviously, customer centricity. The search was then limited adopting other keywords, to better delimit the context of our interest, such as industries, manufacturing, machinery and capital.

The selected variables are shown in *Fig. 3:* and are briefly described in the remainder of this paragraph for each dimension.

Starting from the **strategy** dimension, one of the first important aspect to investigate are the different *criteria for customers and products segmentation*, employed and shared within the company (Kocoure, et al., 2004; Galbraith, 2005; Hollander, et al., 2013) and the *type of relationship with the customer*, in term of duration and degree of formalization, and the *business functions that interact with them* (Shah, et al., 2006; Hechtkopf, 2011). Then, is important to know the *figures dedicated to the customers*, e.g. key account manager, and also the figures dedicated to the products, such as Product manager or Product specialist (Shah, et al., 2006). The dimension investigates also the *management involvement* in troubleshooting customer problems and the ability of the company to communicate closeness to the customers (Ross, 2009; Hayes, 2013; Hinshaw, 2014; He, et al., 2015); the methods characterizing the selection process of the internal staff and the partners, who will manage relationship with the customers (Ross, 2009) and the training of the whole staff involved, in any way, with the customer (Galbraith, 2005); and the incentive systems used to stimulate business staff to exhibit a customer-oriented behaviour (Galbraith, 2005; Hechtkopf, 2011; Hayes, 2013).

Finally, some variables investigate how the company manages *customer experience* (Hechtkopf, 2011; Hayes, 2013; Hinshaw, 2014; Ukko; Pekkola, 2015), how it performs *corrective and improving actions* (Ukko; Pekkola, 2015), how it *monitors the customer* throughout the whole lifecycle (Shah, et al., 2006) and how it *designs products and services* tailored to customer needs (Day, 2003; Kocoure, et al., 2004; He, et al., 2015).

The other four dimensions, instead, are analysed along the customer's lifecycle, providing details about each single phase.

The **Resource** dimension investigates: the main *capabilities* and skills of the



resources involved in the various phases of the customer lifecycle (Galbraith 2005; Hayes, 2013); their level of *customer control* (Gebauer et al., 2011) and the *main channels* through which data is collected along the lifecycle (Ross, 2009; Loshin; Reifer, 2013; Ukko; Pekkola 2015).

In the **Processes**, the main *activities* of the various phases (Manning, et al. 2012) and the formalization of the different business procedures are investigated (Kocoure, et al., 2004). Then, the dimension collects information on *business practices* useful for *data collection, analyse collected data, share them within the company*, and spread them outward, providing the customer with the power to access certain corporate information (Galbraith, 2005; Ross, 2009; Loshin; Reifer, 2013).

The **Technologies** dimension investigates the *ICT tools* used in the company to *collect, analyse, share, and issue customer information throughout the lifecycle* (Galbraith, 2005; Shah, et al., 2006; Hechtkopf, 2011; Loshin; Reifer, 2013).

Lastly, in the **Performance** dimension, *performance indicators*, measured during the customer's lifecycle and its specific phases (Shah, et al., 2006; Ross, 2009; Sohrabi, et al., 2010; Hechtkopf, 2011; Hayes, 2013; Hollander, et al., 2013; Hinshaw, 2014), are analysed.

## 5. Empirical application

With the application of the customer centricity framework (see *Fig. 3:*) on the company sample considered (described in *Table 4*), a cross-examination of the collected data has been carried out.

The objective of the cross-case analysis is twofold: on one hand, it is useful to test the validity of the proposed framework; on the other hand, starting from the best business practices, it is possible to provide some improvement points that will provide concretely help to manufacturing companies that pursue a customer centricity strategy.

For each case study analysed, all the variables have been evaluated based on the information collected during the interviews, using the levels described in the customer orientation model (see *Section 3.1*). In particular, a specific score has been assigned to each level: 1 indicates that the variable has a low customer-orientation, while 3 means that the specific variable is configured in order to sustain a customer-centric model. Thus, the overall score assigned to each company, has been evaluated collecting together each single variable score. Finally, the overall score has been represented with a percentage scale where 100% means that 3 points have been assigned to all the variables (i.e. the company is 100% customer oriented).

The results are shown in the two paragraphs below: the first paragraph performs the strategic dimension analysis; the second one shows the results of companies, in the remaining dimensions of the framework, throughout the customer lifecycle.

### 5.1. Strategy: main evidences

The variables of the strategic dimension have been useful to investigate in cross-mode, regardless of the customer's lifecycle, the strategic aspects of the organization, and how these aspects are tailored to the customers' needs.

*Fig. 4:* shows the positioning of each company as compared to a 100% customer-

oriented organization, according to the variables of the strategy dimension.

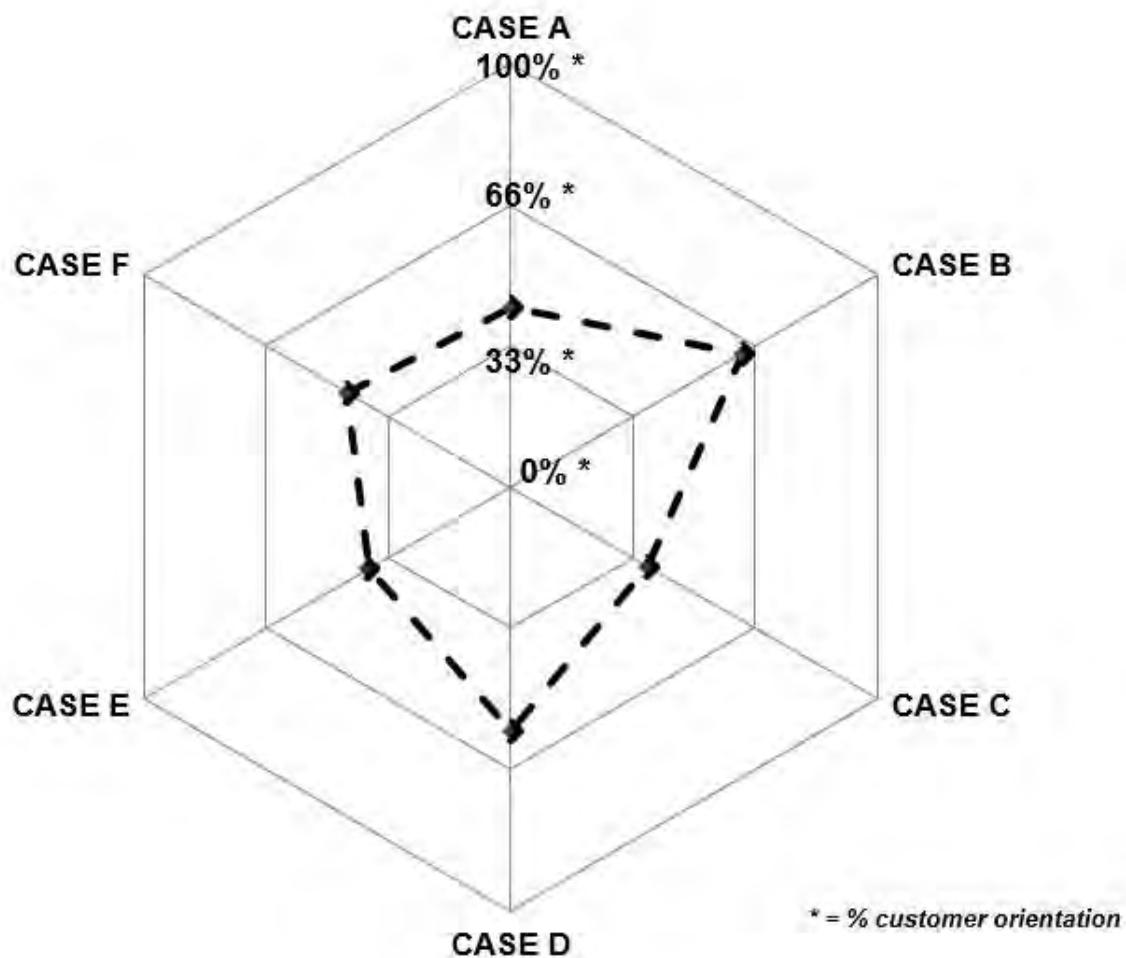


Fig. 4: Sample orientation in the *strategy dimension*

It is easy to observe that the sample under analysis is positioned in an intermediate level of customer orientation.

One of the major issues is the classification of customers: in fact, companies rarely use life-cycle segmentation criteria (e.g. Customer Lifetime Value or customer satisfaction) or, more in general, customer-oriented criteria (e.g. a classification of loyal customers). In addition, there is generally no sharing of such customer segmentation criteria within the company. The management of the customer experience is extremely critical in almost all the companies under analysis: there is often a low customer satisfaction, as well as a system of analysis and re-processing of customer satisfaction data and the development of corrective actions, outcomes of the results obtained. It is very common for the companies to not have a figure responsible of collecting feedback efficiently.

Often, companies do not collect this information because they do not define control points of the client status along its while lifecycle, but only in few phases (e.g. often companies lose customer control when the product warranty is over).

Finally, another critical issue that emphasizes the lack of a customer orientation strategy, regards the incentive systems present in the companies of the sample.

These systems, when are present, are not related in any way to the feedback received from customers on the services provided (e.g. received assistance, installation service, etc.).

## 5.2. Customer lifecycle: main evidences

*Fig. 5:* shows the trend of the individual companies within the sample throughout the different lifecycle phases and the average case trend, obtained combining the mean values of the single companies at each phase. In particular, the graph returns two important results:

- The orientation of individual companies at each phase of the customer's lifecycle;
- Average sample orientation along the customer's lifecycle.

From the *orientation of individual companies*, it is possible to evaluate in which phases the single company is can better meet the customer's needs and demands, namely phases with a high customer centricity level; and in which phases company needs serious improvements in order to increase their level of customer orientation.

However, from the average sample orientation, it is possible to give evidence of the undeveloped phases in terms of customer orientation. In particular, the graph shows that in the first two phases of the customer's lifecycle (Needs assessment and Research), the level of customer centricity is very low. In these phases, in fact, sample companies showed:

- a low level of processes' and procedures' formalization;
- a low level of customer control;
- the lack of adequate channels for collecting customer information and satisfaction;
- the lack of formalized and structured practices for analysing, sharing and disseminating data;
- the lack of proper measurement of performance and their sharing at company level.

Finally, another important issue, that emerged from the interviews, regards the *End of life* phase which, in all the companies of the sample, is still underdeveloped in terms of activities, processes, procedures and dedicated resources.

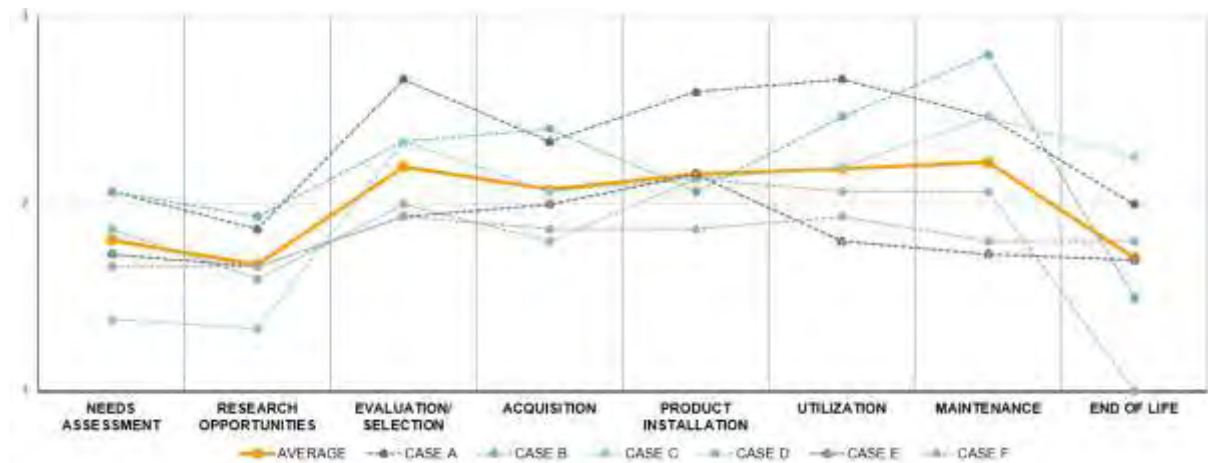


Fig. 5: Sample orientation along the customer's lifecycle

## 6. Discussion

Despite the critical issues outlined in the previous paragraphs, the analysis carried out on the sample has also highlighted some good practices already employed in the companies that represent tips on how to increase the level of customer orientation.

Through the study of the literature, the case history and the empirical application just shown, it had been possible to propose a list of guidelines, reported below, to implement the customer centricity in manufacturing companies. Moreover, these guidelines represent the most significant empirical output of this work as they provide, on a practical level, support to companies that intend to adopt a customer centric approach within their organization.

### **Strategy**

- Development of segmentation criteria customer oriented or based upon the lifecycle of the customers.
- Sharing, among the different functions within the company, of a segmentation criteria customer oriented.
- Active contribution of the client during the design phase (co-design).
- Development of formalized contracts for service (e.g. contracts based on performance and usage).
- Creation of a multifunctional team dedicated to a certain segment of customers, its satisfaction and to provide a long-lasting relationship between the company and the customer.
- Development of advanced outcome model (e.g. pay per use or pay per performance).
- Proactive attitude of the management with respect to the clients (e.g. customer support while defining the solution; visits proactively to the customer; etc.)

- Establish a figure in charge of collecting and processing customer feedback systematically, making it visible and comprehensible to the company's members.
- Development of incentive systems related to the feedback received from customers (e.g. satisfaction on the service received).

### **Resource**

- Definition of contracts regarding helpdesk services to promote a continuous relationship with the clients.
- Development of customer oriented channels to collect information (e.g. dedicated phone line, satisfaction questionnaire, software for remote monitoring).

### **Processes**

- Development of formalized practices for the periodical data analysis (e.g. Periodical company meetings)

### **Technologies**

- Utilization of tools to carry out complex cross analysis of the information received from the data collection, in order to provide outcomes useful to support the management decisions.
- Development of appropriate tools for information sharing between company members (e.g. Internal portal, interactive pages, etc.).
- Development of dedicated tools for the spread of data outside the company (e.g. Web channel)

### **Performance**

- Development of key performance indicators based on the relationship built with the client (e.g. client response time; mapping of loss causes; delivery time of spare pieces; customer loyalty, client satisfaction indicator; purchase opportunities; etc.).

## **7. Conclusion**

In this paper, starting from the existing literature on the subject, a framework made up of 34 variables is developed. This framework is capable of defining customer centricity concept in manufacturing companies (see *Section 4*). Moreover, in order to provide companies an objective measure of their customer orientation level, for each variable, three “customer centricity levels”, retrieved from the literature and integrated with empirical evidences observed during the application of the framework on the sample (see *Section 4.1*), have been defined.

Finally, a further contribution of this work is represented by the guidelines (see *Section 6*), useful to implement the customer centricity in manufacturing companies, Therefore, these guidelines represent a significant practical contribution of this paper, as they represent a concrete support to companies which are increasingly adopting a customer centricity approach within their organization.

To sum up, the tools developed to support the use of the framework and the customer centricity framework itself, can be used by companies to analyse their critical issues in a customer orientation perspective. Managers can also follow the suggested guidelines in order to improve the customer orientation level of their company and consolidate the relationships with their customers.

Nevertheless, this study comes with limitations, some of which offer fruitful avenues for research. In the first place, the extension of the empirical research to different sectors would allow to generalize what has been discovered in this work. In the second place, after verifying the adoption of the guidelines by the companies, is possible to validate the suggestions and integrate them with other best practices. Finally, investigating the reactions and satisfaction among the customer, of new, more customer-centric, business practices, can be helpful for further corrections and improvements.

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# A REVIEW OF PLACE MARKETING FROM A SERVICE-DOMINANT LOGIC VIEW: CO-CREATION, ANTECEDENTS, AND OUTCOMES

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*The place-customer should be viewed as a major co-creator of the value extracted from the experience lived in the place. Consumer resources such as energy, mental disposition, expertise, or involvement may be crucial to explain the final value perceived. It is not clear, however, how effectively the concept of co-creation has been incorporated within place marketing. This research takes a step forward toward covering this gap by: (1) unfolding the place contexts where co-creation approach has been studied in the literature, and (2) examining what is co-creation in each context, regarding behaviours, perspectives, actors involved, antecedents, and outcomes.*

## 1. Introduction

Places are now entities with competitive capacity. Neighbours, cities, regions and nations compete (and cooperate) with each other to attract and satisfy wealth-generating tourists, new residents and investors. Therefore, places, in their diverse forms, have been acknowledged as value creating entities for several actors, both internal (e.g., residents) and external (e.g., tourists). Identifying the value creation processes in places would permit increasing that value. This identification implies recognizing activities, actors, resources and institutions that participate and facilitate value creating process in places, as well as allowing their management towards a higher wellbeing for place stakeholders. However, we cannot overlook the limitations that imply carrying out this analysis, due to the lack of control over the experience-defining factors.

General Marketing and Place Marketing: Convergent or Divergent Fields? Marketing was developed with the aim of managing value-generating products and services in a way that would better fit target audience's needs and wants. This managerial tool had its own evolution, and has not always been suitable to respond to place characteristics. First marketing approaches were focused on product commercialization, and academics aimed their attention at the 4Ps (Product, Price, Place, and Promotion) (McCarthy, 1960). When marketing was recognized as useful for other purposes, some authors argued that traditional commercial marketing was directly applicable to places, if considering the place as a product with different targets (notably those of Kotler; Haider; Rein, 1993; Kotler; Asplund; Rein; Haider, 1999). But this 'product' had special features that hardly suited the well-known 4Ps (Ashworth, 1993; Kavaratzis, 2004). The only appropriate element was 'promotion'. For that reason, some authors preferred to develop a special marketing for places. Shoemaker and Shaw (2008), for instance, proposed the 8Ps. Due to places' fuzziness another alter-

native was to consider the place's image as the 'marketable' element of places. This made place branding a reasonable tool. Service marketing could also be considered, as places are intangible and the inseparability of providers and consumers evident. Although service marketing would allow enhancing the role of consumers in value creation, in places value arises from the consumer's interaction with several services and actors, not with a single provider. Another approach to manage value in places for tourists, residents, internal businesses, and investors has been experiential marketing, because activities and mental processes associated with place marketing, such as travelling, living within a city, and participating in events, are strongly linked with the concept of experience. Nevertheless, even experiential marketing continues considering providers as value creators and consumers as value destroyers. On the contrary, we believe that consumers are not only implied on final value of their experience in places, but they are co-creators.

***New Approaches for Place Marketing: Is Co-creation an Appropriate Approach?*** Co-creation approach contemplates the joint effort of providers and consumers in value creation. Above all, this disruptive conceptualization of marketing challenges product-focused and one-way marketing strategies, by stressing the prominence of customers in value creation. Competitive Logic (Prahalad; Ramaswamy, 2004), Service Logic (Grönroos, 2008), Service Science (e.g., Maglio; Spohrer, 2008; Vargo; Maglio; Akaka, 2008), and Service-Dominant Logic (SDL) (Vargo; Lusch, 2004; 2008; 2016) are some of the approaches that emphasize customer contribution in value creation, the latter probably being the most influential. Those different approaches have been developed concurrently, although sometimes in a divergent manner.

Due to places' complexity and marketing tools' constraints in these complex settings, until the appearance of SDL and value co-creation paradigms, places were 'marketed' separately depending on the target. Destination marketing, hospitality marketing (within service marketing), place marketing, place/destination branding, public marketing, etc. were distinguished. However, interrelation between all the actors in places is obvious. How can a tourist's city-experience be managed without considering residents, or vice versa? To what extent can these experiences be totally controlled, or just determined by the final beneficiaries instead? SDL, in its meta-theoretical level, allows considering places as service ecosystems where all the actors (residents, tourists, investors, government, businesses, etc.) interact with each other and with the environment (natural resources) and integrate resources, co-creating their place-experience value. This means that: (1) All the actors perform service-for-service exchanges, understanding service not as in contrast to products, but as the application of operant resources and provided through complex combinations of goods, money, and institutions (Vargo; Lusch, 2008), and (2) Place-customers integrate a full range of resources (energy, mental disposition, expertise or involvement) leading to sensorial perceptions, emotions, meanings, interpretations, and so on that may enter long-term memory (Park; Vargo, 2012; Jensen; Prebensen, 2015). This makes value perception absolutely phenomenological and experiential.

Place marketing scholars tend to agree that the concept of co-creation should be introduced within theoretical and empirical contributions (e.g., Warnaby, 2009; Baron; Harris, 2010; Neuhofer; Buhalis; Ladkin, 2012). Warnaby (2009), for instance, focuses on SDL and argues that its view of marketing is closer to the singularities of place marketing than previous marketing views. Similarly, Binkhorst and Den Dekker (2009) argue that experience co-creation in tourism is a line of thought that deserves

attention, because tourism is one of the greatest sources of experiences with which people construct their own unique narratives. Park and Vargo (2012) discuss the implications of SDL's key foundational premises for tourism marketing strategy. So, place marketing researchers need to incorporate the co-creation view in their studies. If co-creation (actually) matters in place marketing, and research efforts do not take it into consideration in model devising and empirical tests, our conclusions and recommendations could prove to be misleading, and place marketing strategies might follow the wrong path. In addition, contextualization (i.e., applying the marketing view derived from the co-creation concept to the specific place marketing context) could lead to a modification of the global logic of co-creation. Therefore, considering the co-creation approach in a place marketing context could have synergistic effects and improve both place marketing views and strategies, as well as the way in which the co-creation tenets are altogether understood. Grönroos (2008, 317) suggests that "service logic studies services directly in their marketing context and report on how changing marketing contexts influence the logic required for effective marketing".

However, it is not clear how far the concept of co-creation has effectively been incorporated within place marketing. The conceptual plausibility of the co-creation view could face major difficulties of implementation. SDL, which is probably the most developed of the research streams that embrace the co-creation concept, is still at a meta-theoretical level, although it pays increasing attention to mid-range and micro theoretical perspectives (Vargo; Lusch, 2004; 2008; 2016). The co-creation concept is actually interpreted differently by different researchers and continues to be elusive, as advocates of SDL suggest in a recent work (Vargo; Lusch, 2016). In this controversial context, co-creation metrics are limited (Yi; Gong, 2013; Ranjan; Read, 2016) and ad-hoc interpretations are frequent. And, as widely accepted explanatory models of value co-creation processes are not available, it is not entirely clear what the antecedents and consequences of value co-creation are.

This research takes a step forward toward an effective incorporation of the value co-creation concept in place marketing by: (1) unfolding the place contexts where co-creation approach has been studied in the literature, and (2) examining what is co-creation in each context, regarding behaviours, perspectives, actors involved, antecedents, and outcomes.

To accomplish these aims, the paper is structured in four sections. Section 2 explains the methodology carried out to conduct the systematic literature review of co-creation in place marketing. In section 3 we present the results of the literature review. Lastly, we contribute a final discussion containing some conclusions, implications, and research avenues.

## 2. Research Method

The need to integrate the co-creation concept and framework within place marketing literature has been explained in the previous section. Now we need to analyse in what extent has been studied in the literature. To do so, we have performed a systematic literature review. The aim of our systematic review is to structure the research field on place marketing under the co-creation perspective, specify emergent

themes, point out the most important gaps, and thus contribute to theory development. The review was performed in two steps, comprising (1) a study selection and (2) a study analysis.

First, we selected the studies dealing with co-creation in place marketing by filtering predominantly (a) records identified through Google Scholar, WoS, and Scopus; and (b) records identified by searching for *Hospitality, Leisure, Sport, & Tourism JCR* journals. Other JCR journals in the categories of *Business, Economics* and *Management* were also screened, as well as additional bibliographic references from documents already localized. The search method involved introducing the combination of the terms 'co-creation/co-production' and 'service(-dominant) logic' with the terms 'city/place/destination/tourism marketing/branding'. We only included documents from the year 2000 on. The final number of studies was 155. Only 39 of them were quantitative, which suggested that many quantitative studies on place marketing have not yet embraced the co-creation view. The studies included discussion of the co-creation approach in terms of: co-creation, co-production, customer-to-customer, engagement, experience, interaction, knowledge and skills, participation, relationship, service-dominant logic, service logic, service systems, and value-in-use.

Second, an operative table was built to resume all the information about the 155 documents, towards an easier analysis (Perkmann et al., 2013). This table included the authors, year of publication, journal or book where the document was written, scientific approach (conceptual or empirical), method (qualitative or quantitative), country, subject(s)/actor(s) analysed, the reference to co-creation and city marketing, and the specific focus of the document. The objective, methodology, measured dimensions, and key findings of the text were also collected. The aim is to systematically categorize the content of the documents and identify relationships. Therefore, this synthesis process is inductive and interpretative, derived from the adoption of an explicit and rigorous approach of the review, and allows subsequent analysis; first, to understand how studies were selected, and second, how were the themes build up (Thorpe; Holt; Macpherson; Pittaway, 2005). In this regard, we basically present a structured qualitative thematic examination to provide an in-depth analysis of place marketing concerning the topics of SDL, with special attention towards co-creation.

### **3. Results of the Literature Review**

We have divided our analysis in three major place contexts: (1) hospitality marketing, (2) destination marketing, and (3) public marketing. We have separately evaluated how co-creation was addressed for each context.

#### **3.1. Co-creation in Hospitality Marketing**

Many of the papers studying co-creation in places focus on tourism-related services. Apart from general tourism industry references, we have found analysis in accommodation, restaurants, and travel and tourism settings (i.e., travel agencies, tourism attractions or airlines). In these hospitality contexts, co-creation allows examining value generated in the service exchange process as the joint effort of providers and consumers (Hayslip; Gallarza; Andreu, 2013). For instance, Azevedo (2009) argues that hotel experience is largely determined by the customer. We understand this ap-

proach from a co-creative perspective if holding that hotel customers live individual emotional processes in service experiences, involving their own interactions with employees and physical environment (Walter; Edvardsson; Öström, 2010).

In our literature review we have distinguished three different co-creation approaches in the hospitality context, mostly depending on the degree of involvement or implication of the customer in the co-creation process. These three levels are: (1) customization, (2) co-production, including co-innovation, and (3) interactions.

### 3.1.1. Customization

It is the lowest degree of co-creation. When customizing, consumers choose among different options offered by the provider. In a hotel setting, customization of the service allow guests to have flexible check-in/out times, personalizing room décor, or having childcare options available, which seems to lead to higher value perceptions (Victorino; Verma; Plaschka; Dev, 2005). Customization usually requires basic technological facilities.

### 3.1.2. Co-production

It goes beyond customization, because it implies customer's own resource integration. However, it is a narrow approach of co-creation, because the process is restricted to customer-provider domain and connected to the service exchange and service outcome, more than to the whole experience and its perceived value. For that reason, co-creation is used when they mean co-production. For instance, Grisseemann and Stokburger-Sauer (2012) measure co-creation as the customer's behaviour when arranging a trip –active involvement when packaging the trip, using previous experience, suggest ideas, and spend considerable amount of time.

Co-creation in this level (co-production) is usually addressed as *participation*. Participation can be defined as “customer's active role, which includes supplying activities and inputs rather than simply being present or having contact with service employees during the service encounter” (Chen; Raab; Tanford, 2015). Similarly, Hsiao, Lee, and Chen (2015, 47) argue that “the level of customer value co-creation is the meaningful and cooperative participation of customers during the process of service delivery”. Their co-creation measure is the only one in the whole literature review using a validated co-creation scale (Yi; Gong, 2013) in hotels, which assesses co-creation as a two-factor construct, including participation behaviour (information seeking, information sharing, responsible behaviour, and personal interaction) and citizenship behaviour (feedback, advocacy, helping, and tolerance). Another citizenship behaviour approach is customer online content creation. Some authors have addressed co-creation as customer's contribution with online reviews, mostly from a managerial perspective (Park; Allen, 2013; Wei; Miao; Huang, 2013). Accordingly, customer's engagement in social media activities has been frequently studied (Dijkmans; Kerkhof; Beukeboom, 2015; Cabiddu; De Carlo; Piccoli, 2014). Other authors addressing co-creation in terms of participation are Mohd-Any, Winklhofer, and Ennew (2015), who study how co-creation (co-production) in a travel website setting affects e-value. They argue that co-creation implies customer's direct participation in service creation through the utilization of the features and functionalities of websites and that co-create service experience as they think, act, and sense using those features.

Generally, co-production focuses on co-creation before and during service. However, we found other approaches studying co-creation after the core service, through additional service offerings –prevention, education, and feedback (Wang; Hsieh; Yen, 2011) and co-recovery (Xu; Marshall; Edvardsson; Tronvoll, 2014). In this level of co-creation (co-production) there is no space for improvisation, and the customer is treated as a partial service worker. Sometimes co-creation is the answer to the provider's question: what can the customer do for me?

We have identified some antecedents of co-production in the revised papers; that is, some resources that encourage customer's co-production. On the one hand, we have detected customer resources, such as involvement (Wang et al., 2011), including purchase importance (Chen et al., 2015), and specialized knowledge and skills, as role-clarity and self-efficacy (Chen et al., 2015). On the other hand, we have detected provider resources, such as company support to co-create, which can be high, moderate and low, depending on the communication degree between the customer and the company regarding interaction frequency, interactions' standardization and the way of contacting (Grisseemann; Stokburger-Sauer, 2012). Employees have been also acknowledged as important. Concerning employees, their capacity to educate customers (Wang et al., 2011), and their positive psychological capital (Hsiao et al., 2015) can increase customer's co-creation. In the same vein, servant leadership and service-oriented organizational behaviour are thought to positively affect employees' attitude.

**Co-innovation.** We found a co-production-level form of co-creation that we think deserves special attention. Several papers in the literature deal with co-innovation. Co-innovation refers to consumer's involvement in new service development. Therefore, there has been acknowledged that consumers in the tourism industry (i.e., visitors) can provide their creative insights with innovative purposes (Konu, 2015; Lee; Tussyadiah; Zach, 2010). This allows achieving more adapted ideas, reduction of time, and efficiency in the new service development process, which, in turn, leads to increasing customer results (Rodríguez; Álvarez; Santos-Vijande, 2011). For instance, Ordanini and Maglio (2009) propose in a qualitative paper the SDL mind-set for new service development in hospitality industry. In general, even though authors do allude to SDL, they focus on specific contributions of consumers in innovation processes, valuing the information and knowledge gained from them and concentrating on knowledge transfer and knowledge management (Sigala; Chalkiti, 2015; Hoarau; Kline, 2014). In this respect, Shaw, Bailey, and Williams (2011, 212) argue that “within the hotel industry, there is an emerging trend of customers viewed as an operant resource in the co-creation process surrounding innovation, although this is not yet the dominant paradigm”. Lee et al. (2010) concentrate on the launch stage and investigate possible improvements in a new tourism product through spatiotemporal movement pattern observation of visitors and specific evaluations. However, customer co-creation for innovation is not restricted to launch stage. Santos-Vijande, López-Sánchez, and Pascual-Fernández (2015), for example, recognized six different new service development stages where customers can collaborate: idea generation, idea selection, business analysis, service and delivery process development process, market test, and market launch. Most authors addressing co-innovation adopt a provider perspective, where providers invite customers to collaborate in new service development processes in different collaboration degrees: frequent meetings, active participation in the development team, or detailed consultation (Santos-Vijande et al., 2015). Ku, Yang, and Huang (2012) call it customer competence.

In the literature we have detected several antecedents for new service development co-creation, but only one referring to customers: customer's expertise in information technology (Shaw et al., 2011). On the contrary, provider resources have been widely studied in the co-innovation context. To begin with, provider should have an innovative orientation (Tsai, 2015), both internal and external (Ku et al., 2012; Rodríguez et al., 2011). Internal orientation towards innovation implies top managers and employees, and concerns support of new services development, allocation of necessary resources, and creation of a multidisciplinary team responsible for new service development (Santos-Vijande et al., 2015). Additionally, Tsai (2015) described employee engagement as one of the co-creation capability factors. Employee engagement includes, for instance, employees' motivation and reward to make them contribute to innovation objectives, planning, execution, and quality elevation. Market orientation towards innovation implies partners (Hsieh; Yuan, 2011; Hsu; Hsieh; Yuan, 2013), and specially customers (Tsai, 2015). To harness customer expertise the firm requires a management environment that embraces knowledge sharing amongst its workforce (Shaw et al., 2011).

### 3.1.3. Interactions

Some researchers focus on interactions with other customers, firm employees, and the environment as antecedents of the final perceived value. This interactive view of co-creation adapts SDL narrative around value co-creation. Leask, Fyall, and Barron (2013), for instance, claim that when visiting attractions, co-creation involves the consumer interacting with others, often at multiple stages of the consumption experience. Walter et al. (2010) argue that customers live individual emotional processes in service experiences (i.e., co-creation) involving customer's own interactions with employees and other guests, as well as with the physical environment (servicescape). Other interactive perspectives include: service workers misbehaviours in tourism industry (Harris, 2012), effect of customer-to-customer interactions on customer satisfaction with hotels (Fakharyan; Omidvar; Khodadadian; Jalilvand; Vosta, 2014), or human interactions (i.e., guest-to-guest and guest-to-staff interactions) representing customer involvement in the production and consumption of cruise ship service.

In this case, co-creation needs a good service atmospherics for interactions to occur (Fakharyan et al., 2014). Online social media plays an increasingly important role (Leask et al., 2013). Other customer resources that also facilitate interactions are financial resources, involvement, time, personnel attitude and skills, and ability to socialize (Leask et al., 2013).

## 3.2. Co-creation in Destination Marketing

Tourism and city competitiveness in the global marketplace have usually been targeted by destination marketing. As we have been able to notice, co-creation approach has been addressed in destination marketing more than in other place contexts. However, this has been done quite dissimilarly. We have found two major approaches: (1) Provider perspective, where co-creation is integrated in the traditional destination marketing as a new tool (co-production and co-innovation), and (2) consumer perspective, where tourist and his/her experience is the new focus, and co-creation an implicit process of value creation in this context.



### 3.2.1. Provider Perspective

It implies obtaining superior value propositions for improving place (i.e., city, region, nation) competitiveness (Piciocchi; Siano; Confetto; Paduano, 2011). As in hospitality services, some authors have addressed co-creation in a co-innovative level. Tourists are resources and providers can integrate tourists' creativity and ideas in the process of new tourism product/service development and innovation. Therefore, providers can support customers with toolkits to create their own innovations (Prebensen, 2014). Tussyadiah and Zach (2013) argue that co-innovation requires co-creation capability: explorative, transformative and exploitative capacity that improves DMO performance.

Other authors have addressed co-creation in a co-production level. New service paradigms can play an important role within the strategic and operational models of destination management, because stimulate, improve, and facilitate collaboration among different categories of operators offering tourism services (Carrubbo; Moretta Tartaglione; Di Nauta; Bilotta, 2012). Thus, this approach considers co-creation between tourism service suppliers (i.e., co-production networks). To achieve competitive networks, it is important to (1) recognize and include all the actors involved in the tourism experience provision, (2) analyse the pattern of relationships of the tourism stakeholder network and the nature of interactions derived from power and legitimacy distribution (Nogueira; Pinho, 2015), and (3) establish a network governance, regulated and coordinated by DMOs (Polese; Minguzzi, 2010; Melis; McCabe; Del Chiappa, 2015). Therefore, these authors understand that co-creation occurs when firms create experience spaces, where, if appropriate, customers will develop experiences that suit their own needs and level of involvement (Morgan; Elbe; de Esteban Curiel, 2009). Competitive logic argues that this co-created experience spaces should be based on a four-pillared theatre composed of dialogue, transparency, access to information, and risk-benefit assessment (Melis et al., 2015). A frequent setting for co-creative (co-productive) networks is sustainable and rural tourism, where actors seem to be closer to each other and more compromised towards local environment. Scott and Cooper (2010), for instance, examine a series of strategic initiatives that have been undertaken by a State Tourism Organization in Australia to develop a tourism network to achieve sustainable urban tourism in the nation. Networks also permit democratization of decision-making (Zou; Huang; Ding, 2014).

This co-creation perspective in destination marketing is related to what SDL has conceptually called 'value proposition'. Even though value proposition is important for the subsequent co-creation process (Mathisen, 2014), several papers already acknowledge that we should (1) consider broader network perspectives and include other actors, and (2) we should change the focus from value proposition co-production to tourism experience co-creation, largely determined by the tourist itself.

First, an extended view of tourism networks includes not only tourism providers (hospitality services) and DMOs, but also local population, and tourists themselves (Kastenholz; Carneiro; Marques; Lima, 2012), because they all provide resources that affect final destination experience value (Line; Runyan, 2014). Actually, some authors visualize territory as systems, instead of as a resource to consume, a product to promote, or scenery (Piciocchi et al., 2011). Sfandla and Björk (2013) explore co-creation of experiences (in contrast to co-creation of value propositions) and suggest going beyond Experience Supply Chain towards Tourism Experience Network, a model inspired in the ARA model but adapted to establish new relationships and ex-

tend the meaning of actors to include consumers/tourists. The real disruptive work, the actual co-creation, is, in fact, involving the tourist in the value-creating network. Sometimes the tourist is not just identified as being 'involved', but as 'network creator': "the tourist creates his/her own tourist product by interacting with many enterprises, institutions and people and thus initiating a network of subjects that influences his/her experience" (Barbini; Presutti, 2014, 192).

### 3.2.2. Consumer Perspective

The tourist's prominence leads to the last co-creation level perceived in the literature, that is, situating the focus on the tourism experience. Different tourists will live different experiences in the same destination. This happens because experiences and thus value are contextual and idiosyncratic; so, each tourist will perceive the same destination in its own way (Chekalina; Fuchs; Lexhagen, 2014). Therefore, the tourist is the protagonist of his/her own experience and a leading co-creator of his/her unique experience (Blazquez-Resino; Molina; Esteban-Talaya, 2015). Value is embedded in the experience and not in value propositions (i.e., destination) (Majdoub, 2013). The experience is shaped by the tourist, enabled by his/her own resources and the artefacts and context provided by the (eco)system (i.e., the destination) (Prebensen, 2014). Thus, tourists are value experience co-creators. However, it is not clear yet how do these co-creation processes occur. What is co-creation?

We can say that: *co-creation involves all the tourist interactions with other people and with products and services in various servicescapes that affect destination experience value and results in increased (or decreased) values for themselves and others* (based on Prebensen, 2014; and Prebensen; Vittersø; Dahl, 2013). Therefore, (1) co-creation can occur before, during and after travel; that is, we can distinguish pre-travel, on-site, and post-travel co-creation (Neuhofer et al., 2012; Prebensen, 2014); (2) different actors co-create experience value: tourism suppliers as facilitators, friends and peers as social networks in and out of the destination, tourism co-consumers (e.g., other tourists), and tourism consumers, which are the central element in the experience (Neuhofer et al., 2012); and (3) interactions have a central role.

Experience is created and therefore co-created during the process of planning, buying, enjoying, and recalling the tourist journey (Prebensen; Woo; Uysal, 2014). Sunti-kul and Jachna (2016), for instance, measure co-creation as the 'activities in which tourists engage', including watching people, spending extra time just enjoying being in the place, consulting guidebooks or on-site signs, exhibiting willingness to learn more about the place, interacting with local people, and talking with others in a group about the place.

Co-creative interactivity has frequently been studied in the literature, especially provider-visitor interactions (e.g., Huebner, 2011), but also tourists' interactions with other tourists (Månsson, 2011; Rihova; Buhalis; Moital; Gouthro, 2015; Yang, 2015).

The role of technology, ICTs and online social networks has been another gold mine, arguing that they have drastically enhanced and facilitated co-creative behaviours, such as searching travel-related information and sharing personal experiences, comments and opinions (Nusair; Bilgihan; Okumus, 2013; Pera, 2017). Neuhofer, Buhalis, and Ladkin (2014) propose Technology Enhanced Tourism Experience as the outcome of the co-creation experience catalysed by ICTs. It has also been dis-

cussed how both intensity of co-creation and intensity of technology increase perceived value (Neuhofer; Buhalis; Ladkin, 2013). Co-creation has also been found to contribute to tourists' place attachment (Suntikul; Jachna, 2016).

We have also detected several authors addressing antecedents of value co-creation, i.e., resources that increase and facilitate co-creation processes. Operand resources as time, effort, and money (Prebensen, 2014) and operant resources such as involvement (Altunel; Erkut, 2015) and knowledge and interest (Calver; Page, 2013) are some of the customer's resources we found. Technology in general and ICTs in particular has also been thoroughly studied as a resource for both, consumers (tourists) (Månsson, 2011) and tourism companies (Neuhofer et al., 2012; Nusair et al., 2013; Buhalis; Foerste, 2015). Websites, for example, can be a discussion forum to share feedback and information, as well as a platform facilitating customer-provider interactions and an easier access to different services (Tilaar; Novani, 2015).

### **3.3. Co-creation in Public Marketing**

The least studied context is the one dealing with internal stakeholders (citizens and local businesses) co-creating value in the city. We refer to interactions between residents and local entrepreneurs with their city and city authorities. We have found three major approaches: (1) co-creation in public governance, (2) co-creation in public transport, and (3) co-creation in place branding.

#### **3.3.1. Co-creation in Public Governance**

Some authors propose that new public governance should be based on SDL and public service co-creation (Osborne; Radnor; Nasi, 2013). This would substantially improve city actors' satisfaction. The collaborative dimension of governance consists on citizens involving in creating circular links between services planning, provision and performance, as well as citizens creating feedback based on a two-way communication. We know that residents have knowledge about public issues and the opportunity of influencing agendas and improve services. For that reason, a proactive behaviour of local government official consisting on providing tools and resources to support interaction (i.e., citizen orientation) (Cassia; Magno, 2009) and platform orientation make possible to extend the collaborative dimension of governance in the form of co-design, co-creation and co-production (Anttiroiko; Valkama; Bailey, 2014). Zenker and Seigis (2012), for instance, aim to empirically explore residents' participation as a solution for conflict-laden place development projects. The study shows that even though citizens' participation has a positive impact on commitment for the project and to the city, the general satisfaction with the city, and the feeling of trust for the city officials, the same cannot be said about the participation type (binding character, question type, and number of participation times).

#### **3.3.2. Co-creation in Public Transport**

We have found few papers working on co-creation on a specific public service setting: bus transport. However, getting passengers involved in providing real time information that is valuable to others and to the public transport operator themselves (Nunes; Galvão; e Cunha, 2014) seems to be a limited view of co-creation that implies customer's citizenship behaviours that improve provider's situation.

The antecedents identified for this co-production are: mobile computing devices and appropriate technology for crowdsourcing, passengers' knowledge (information), and ability of the firm to transform passengers' individual knowledge into structured information. In the same context, some studies suggest that an SDL-based bus service dramatically outperforms a GDL-based one with similar functionality, because it is able to dynamically reconfigure its resources to empower the user to co-create value. Specifically, constellation of intangibles, operant resources and information symmetry are demonstrated to be the prerequisites (antecedents) for favourable customer service experiences (Edvardsson; Ng; Choo; Firth, 2013).

### 3.3.3. Co-creation in Place Branding

This approach consists on considering city stakeholders as necessary or interesting contributors in place branding processes. We have identified two different approaches, depending on the perspective. A provider focus approach involves adopting co-creation within a conscious place branding process launched by city administrators (Ahn; Hyun; Kim, 2015; Braun; Kavaratzis; Zenker, 2013; Hakala; Lemmetyinen, 2011; Zenker; Erfgen, 2014). A more customer focus approach involves co-creation as the implicit process happening when city stakeholders build brand meanings, sense of place and brand experiences (Aitken; Campelo, 2011; Klijn; Eshuis; Braun, 2012; Szondi, 2010).

## 4. Final Discussion

The idea of co-creation has been widely accepted among place marketing scholars. However, it is not entirely clear how much progress has been made to date in effectively incorporating the concept of co-creation in place marketing. This research takes a step forward toward covering this gap by: (1) unfolding the place contexts where co-creation approach has been studied in the literature, and (2) examining what is co-creation in each context, regarding behaviours, perspectives, actors involved, antecedents, and outcomes.

We encountered three different contexts where co-creation has been studied within a place setting: hospitality marketing, destination marketing, and public marketing.

Overall, we found that the co-creation process has been mostly approached in a mixed, incomplete, and ad-hoc way. Thus, some authors refer to co-creation and implicitly assume that it occurs, but do not explicitly conceptualize and measure co-creation. In fact, quantitative papers are rather scarce -approximately 25% of the total. Other authors explicitly measure co-creation but sometimes the metrics used are not accompanied by a proper definition, and when co-creation is defined, it is done in different ways. Usually, authors identify co-creation with partial elements of the whole co-creation process, such as customization, core service co-production, suppliers' co-production networks in a region, citizenship behaviour of consumers, consumer support for providers' innovation processes, and interactions. Most of these approaches are close to the Good-Dominant Logic, as consumers are viewed as partial employees who may improve providers' circumstances. Most papers tend to consider co-creation as a variable reflecting a new way for providers to extract value from customers; a pretext to utilize them as part-time workers or for internal processes, such as innovation.

Most of the studies we reviewed reflect a preference towards dealing with co-creation before and during the service. However, an integrated co-creation view in place marketing would embrace co-creation throughout the whole value creation process, including co-creation after the core service is received.

Most studies tend to assimilate co-creation with interactions between actors. While co-creation frequently implies interactions among different actors, there are co-creation processes in which interactions are missing (e.g., positive thoughts about a future trip).

The consumer is frequently asked about the provider service, and, to a lesser extent, about her/his interaction with the provider and with other consumers and relatives.

Therefore, a clear research avenue stemming from this research consists of developing a comprehensive concept and metric of value co-creation in place marketing, which: (1) considers behaviours before, during, and after the core service is received; (2) considers all the actors implied in the place experience, including local population, local enterprises, hospitality service providers, local, regional and national authorities (government), and tourists, centering the attention on the final beneficiary (i.e., consumer); (3) considers both interactions with third parties and internal processes; (4) adopts a consumer view (i.e., behaviours that can improve consumer circumstances instead of those of the provider; what can I do for the consumer? instead of what can the consumer do for me?); and (5) goes beyond dyadic relationships towards networking and systemic approaches. The leading role of ICTs, interaction platforms, a customer-oriented firm culture, customer's involvement, and customer's knowledge and skills should also be integrated in a co-creation model as antecedents and co-creation enhancers.

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# AN INFORMATION SYSTEM FOR CONTEXT-AWARE SERVICE ENGINEERING

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*Service engineering provides various methods for developing and providing services. However, most of these methods are bound to a specific service type or focus on a specific aspect. Due to the existing innovation pressure, companies need to design new services for which existing methods often cannot be used. In this paper we present an approach for context-aware service engineering based on the situation-specific combination of method fragments. Due to this combination, a customised development and provision method can be created. Furthermore, we developed an information system to support service providers creating their individual methodological approaches.*

## 1. Introduction

Today, services are the most important economic sector in the majority of western societies. Due to this fact, the service sector is characterised by an ever-increasing economic pressure. To survive in this market environment, companies, on the one hand, rely on effective and efficient service provision. On the other hand, innovations are necessary to distinguish from competitors (Heiskala, et al., 2005). The service engineering discipline has been established as a response to these challenges (Fährnich & Optitz, 2006).

For effective and efficient service development and provision, a predefined structured approach (hereinafter called method) is necessary. Until today, the service engineering discipline yielded a wide range of methods that are used in practice. However, existing methods are characterised by several shortcomings. One of the main shortcomings is their lack of flexibility concerning influencing factors like service characteristics or the specific situation of a service provider (Meyer & Böttcher, 2012). Usually, methods are tailored for a specific kind of service, e.g. IT-based services (Meyer, 2009). In addition, a great number of methods focuses solely on a single aspect of service development, e.g. internationalisation (Freitag, 2014). In particular new and innovative services with unique characteristics often lack support by adequate methods. As an example, a large number of methods for product service systems had to be developed. A demand for new methods can also be recognised in the area of industrial services due to the proliferation of industry 4.0 approaches (Erol, et al., 2016). Due to this fact, it is necessary to develop new methods or restructure existing ones which results in additional planning effort. As a result of missing empirical evaluation of these method, uncertainties increase (Dolfsma, 2004; Gremyr, et al., 2014).

To overcome the challenges, we present an approach and a supporting information system for context-aware service engineering in this work. The approach is based on

using so-called method fragments. Each method fragment represents a specific activity in a service development and provision process. By an individual combination of method fragments, it is possible to generate a service engineering method that is suited to a specific service project and a specific situation of a service provider.

The research presented in this paper follows a design science approach. According to Wieringa (2014), we distinguish between knowledge goals (to understand a research area) and design goals (to create new artifacts). Both types of goals are dependent, since design goals reflect insights obtained by achieving knowledge goals. For our research, we focus on method fragments for customisation of services. Thus, our knowledge goals are as follows:

- Knowledge Goal KG1: We will analyse concepts for customising services and service characteristics that are relevant for customisation.
- Knowledge Goal KG2: We will analyse dependencies between concepts and characteristics and ways to aggregate both into method fragments.

The design goals of this work focus on developing an information system containing method fragments. Based on the characterisation of service projects, appropriate method fragments are selected and a customised method is created.

- Design Goal DG1: We will develop an approach for development and provision of customisable services based on method fragments. The approach can be adapted to various service and customer characteristics.
- Design Goal DG2: We will develop an information system providing method fragments which allows users to identify appropriate method fragments for specific services.

The remainder of this paper is structured as follows. In the next section, we present the approach and derive requirements for the information system and method fragments. Section 3 gives technical insights about the information system. The method fragments, which are aggregated in the system, are presented in section 4. The paper is concluded by an evaluation and an outlook on future research steps in section 5.

## **2. Research Approach**

In this section, we present requirements for the technical development of the information system and for the specification of method fragments. Using these requirements, it is possible to evaluate the artifacts that were developed during the design science research project. In addition, we give a short overview about the metamodel which is the foundation for the information system.

### **2.1. Requirements for the solution**

After motivating the research, as a second step of the design science research process, objectives of the solution are defined. For doing so, we present requirements

for artifacts which consist of two parts. First, requirements for the information system are presented. Second, requirements for the method fragments are established.

We understand an information system as a human-machine-system providing information for execution, governance, and analysis (Krcmar, 1990). Core elements of these systems are technical infrastructure, databases, transaction systems, operating systems, and support systems (Davis, 2003). The information system presented in this paper focuses on operative and strategic control of service providers. Thus, databases, transaction systems and support systems are central aspects. The requirements for the information system are presented in Table 1.

Requirement	Description
<b>Database: maintain method base</b>	
FA1	Create and edit method fragments
FA2	Describe service characteristics
FA3	Define dependencies between method fragments
<b>Support system: select method fragments</b>	
FA4	Specify a situation
FA5	Identify adequate method fragments
FA5	Combine method fragments
<b>Transaction system: perform a service project</b>	
FA7	Integrate method fragments into a method
FA8	Transform method into a workflow management format
FA9	Perform service based on method fragments

Table 1: Requirements for the information system

The requirements for method fragments (see Table 2) are derived from the research goals and the service engineering challenges as presented above.

Requirement	Description
AI1	Method fragments reflect concepts for customer-individual customisation of services.
AI2	Method fragments describe product, process, and resource dimensions of services.
AI3	Method fragments reference service characteristics and external influence factors.
AI4	The method base provides a structure and an approach for retrieving method fragments appropriate for a specific situation.
AI5	The method base provides a structure and an approach for combining method fragments with each other.
AI6	The description of method fragments adheres to a coherent structure.

Table 2: Requirements for method fragments

First of all, method fragments need to reflect approaches for customer individual service development and provision (research goal KG1, requirement AI1). To allow for a holistic description, the three aspects service result, process, and resources must be addressed (research goal KG1, requirement AI2). In addition, it is necessary to include external influencing factors for defining contextual information (research goal KG2, requirement AI3).

To allow for selection of method fragments according to a specific context, it is necessary to provide means for identification of adequate method fragments. This includes, on the one hand, criteria for defining contextual information. On the other hand, an approach for matching criteria with method fragments is necessary (research goal DG1, requirement AI4). For establishing a service engineering method, it is not sufficient to consider method fragments isolated from each other. Instead, it is necessary to provide guidelines on how to combine different method fragments with a particular focus on avoiding inconsistencies. Therefore, dependencies between method fragments need to be considered, too (research goal DG2, requirement AI5). Finally, the method fragments need to adhere to a predefined and unified structure to allow for selection and combination (research goal DG2, requirement AI6).

## 2.2. Method fragment metamodel

For being able to implement an information system, we first developed a metamodel for method fragments. An overview of the metamodel is presented in Figure 1. For a more detailed description of the metamodel refer to Becker & Klingner (2016).

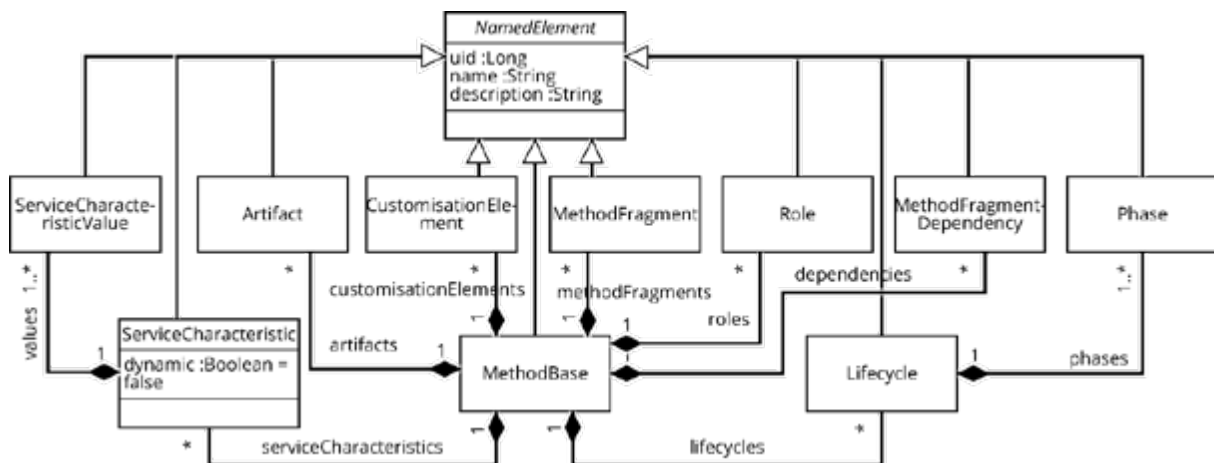


Fig. 1: Metamodel of the information system

The metamodel incorporates the most important elements for context-aware service engineering. A special focus lies on method fragments and service characteristics. The method fragments are the core element of the information system. Each fragment is a self-contained part of a method (Brinkkemper, 1996). The information system allows for an individual combination of method fragments to generate a thorough method. An overview about method fragments for customisation of services according to customer demands is given in section 4.

The service characteristics are used to describe appropriate situations for applying method fragments. Thus, each fragment is assigned to a specific set of characteristic values. The same characteristics are used to define a service project. Section 3.2



presents an overview about the mapping process between service projects and method fragments.

The *method base* is the central data base of the information system. All the other elements like service characteristics, method fragments, roles, and phases are encapsulated in the method base.

### 3. Information system

Based on the requirements established in the previous section, in the following section we describe the general architecture of the information system. As shown in Figure 2, the system consists of three main components and an interface to external systems. The component *method base* provides predefined method fragments. The component *project characterisation* is used for defining a specific service project by selecting and combining appropriate method fragments. The selected method fragments are transformed into an executable format by the component *workflow management*. Finally, the workflow is executed by a workflow management system.

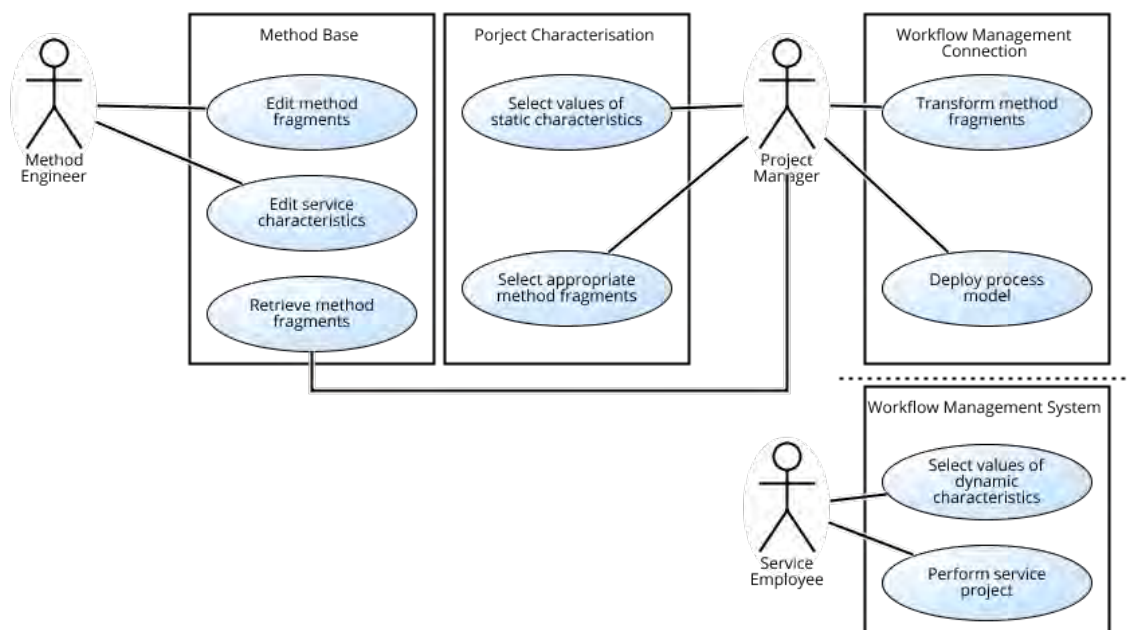


Fig. 2: Architecture of the information system

According to the architecture presented in Figure 2, the components of the system are loosely coupled. This allows for replacing single components, e.g. using different workflow management systems. In addition, the existing components can be distributed on different IT systems resulting in security improvements. For example, it is possible to maintain the method base on a company-internal system while other components like project characterisation are executed on the client-side.

#### 3.1. XML data interchange format

To achieve a loosely coupled system, standardised data interchange formats are used. For this, the components of the system provide XML import and export inter-

faces. For defining the XML interchange format, we have extended the existing Software and Systems Process Engineering Metamodel (SPEM)<sup>1</sup>. SPEM is an established method engineering approach for defining processes and activities. The Eclipse Unified Method Architecture (UMA)<sup>2</sup> provides a concrete XML implementation of SPEM. Therefore, UMA defines an XML schema for specifying the data interchange format. Table 3 presents an overview about necessary data types for specifying service engineering methods. In addition, the table shows whether these data types were added to the SPEM metamodel.

Data type	Description	New
<b>MethodFragment</b>	Method fragments are the central element of the information system and represent a self-contained part of a method.	Yes
<b>ServiceCharacteristic, ServiceCharacteristicValue</b>	Service characteristics define appropriate situations for using method fragments. It is possible to distinguish between static characteristics, having the same values for every service provision, and dynamic characteristics with different values.	Yes
<b>Role</b>	Roles represent participants of the service performance.	No
<b>RACI</b>	Using a RACI matrix, it is possible to define responsibilities for performing method fragments.	Yes
<b>Phase</b>	Phases are used to divide service development and performance in different parts.	No
<b>Lifecycle</b>	A lifecycle defines the sequential order of phases.	Yes
<b>CustomisationElement</b>	Customisation elements determine the aspect that is focused by a method fragment.	Yes
<b>Artifact</b>	Artifacts are, on the one hand, used to perform a method fragment. On the other hand, artifacts are results of performing a method fragment. It is possible to distinguish between mandatory and optional artifacts.	No
<b>MethodFragmentDependency, MethodFragmentDependencyType</b>	Using dependencies between method fragments, it is possible to restrict the combination of fragments. Therefore, different types of dependencies (requires, mutual exclusion etc.) are used.	Yes

Table 3: Data types for service engineering methods

<sup>1</sup> <http://www.omg.org/spec/SPEM/2.0/>

<sup>2</sup> [https://eclipse.org/epf/tool\\_component/EPF\\_Schema\\_201003161045.xsd](https://eclipse.org/epf/tool_component/EPF_Schema_201003161045.xsd)

We have defined a base type *MethodBaseContentElement* as the parent data type for all elements of the method base. In this data type, the attributes *id*, for a unique identification of elements, and *name* are defined. For every data type that was newly

```
<xsd:complexType name="ServiceCharacteristic">
  <xsd:complexContent>
    <xsd:extension base="uma:MethodBaseContentElement">
      <xsd:sequence><xsd:element
name="ServiceCharacteristicValue" type="uma:ServiceCharacteristicValue" minOc-
curs="1" maxOccurs="unbounded" /></xsd:sequence>
      <xsd:attribute name="dynamic" type="xsd:boolean"
use="optional" default="false" />
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name="ServiceCharacteristicValue">
  <xsd:complexContent>
    <xsd:extension base="uma:MethodBaseContentElement" />
  </xsd:complexContent>
</xsd:complexType>
```

Listing 1: XML-Schema for defining service characteristics

developed, we have specified an XML schema definition. Based on this schema definition, it is possible to create an instance of the specific type. For example, Listing 1 presents an excerpt from the XML schema for specifying service characteristics.

The data type definition starts with the keyword *complexType*. According to the definition of line 4 in Listing 1, every *ServiceCharacteristic* has an arbitrary amount of values (at least 1, defined by using the keywords *minOccurs* and *maxOccurs*). The type of the service characteristic is defined by using the attribute *dynamic* which is of type *Boolean* and, thus, can either be true or false. Lines 9 up to 13 show the definition for specifying values. The data types *ServiceCharacteristic* and *ServiceCharacteristicValue* are both derived from the base type *MethodBaseContentElement* (see lines 3 and 11).

Listing 2 shows the specification of three service characteristics using the schema definition. In lines 1 to 4 of the listing, the characteristic *Customer Influence Possibilities* is defined. Possible values of this characteristic are *High Influence Possibilities* (line 2) and *Low Influence Possibilities* (line 3). The characteristic *Service Interface* with its values is defined in lines 5 to 8. Both characteristics are static due to the fact that the attribute *dynamic* is not set manually and, thus, the default value *false* is set.

Contrary to the two static characteristics, the characteristic *Customer Willingness*, defined in lines 9 to 12, is dynamic. This is due to the fact that different customers have different willingness for active participation in the service process. Thus, the characteristic is different for every service provision.

```
<ContentElement briefDescription="..." id="sc_1" name="Customer Influence Possibilities" xsi:type="uma:ServiceCharacteristic">
  <ServiceCharacteristicValue briefDescription="..." id="scv_1" name="High Influence Possibility" />
  <ServiceCharacteristicValue briefDescription="..." id="scv_2" name="Low Influence Possibility" />
</ContentElement>
<ContentElement briefDescription="..." id="sc_16" name="Service Interface" xsi:type="uma:ServiceCharacteristic">
  <ServiceCharacteristicValue briefDescription="..." id="scv_33" name="Machine Interface" />
  <ServiceCharacteristicValue briefDescription="..." id="scv_34" name="Human Interface" />
</ContentElement>
<ContentElement briefDescription="..." dynamic="true" id="sc_15" name="Customer Willingness" xsi:type="uma:ServiceCharacteristic">
  <ServiceCharacteristicValue briefDescription="..." id="scv_31" name="High Willingness" />
  <ServiceCharacteristicValue briefDescription="..." id="scv_32" name="Low Willingness" />
</ContentElement>
```

Listing 2: XML-Definition of service characteristics

Using the XML schema as exemplified by the definition of service characteristics, it is possible to establish a holistic method base containing all relevant elements for service engineering. The formalised definition of service engineering method elements satisfied the first three requirements (FA1, FA2, and FA3) defined above. It also provides a foundation for selecting appropriate method fragments as described in the next section.

### 3.2. Project characterisation and method fragment retrieval

The project characterisation component of the information system allows for identifying appropriate method fragments for a specific service project. It is based on the general procedure as presented in Figure 3.

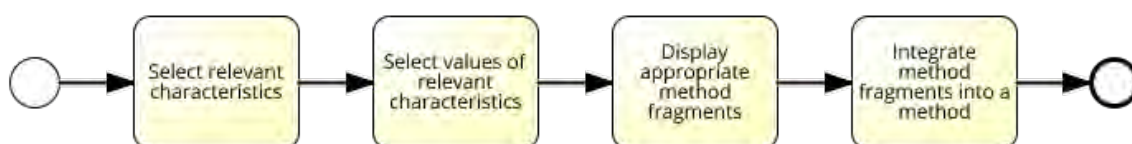


Fig. 3: Process for characterising service projects and retrieving method fragments

Due to the fact that innovative service projects are often characterised by uncertainties regarding the fine-grained design, it is usually not possible to assign values for all service characteristics of the method base. Therefore, as a first step, relevant service characteristics are selected. Based on this selection, values for these characteristics are assigned.

To ensure consistency of the service project characterisation with the description of method fragments, the characterisation component uses the same characteristics as the method base. However, only static characteristics are presented because service providers cannot foresee the characteristics of customers that consume their services. Thus, dynamic characteristics are assigned during service provision.

Based on the selected service characteristic values, the system identifies appropriate method fragments. For doing so, method fragments that match the specified characteristics are identified. It is possible to distinguish between *full matches* (all values of all relevant service characteristics match) and *partial matches* (a subset of values of relevant service characteristics matches). Partial matches are useful in cases of greater uncertainty about service characteristics.

Based on the initial selection of method fragments, the system evaluates dependencies between method fragments. Amongst others, it identifies method fragments that are mutually exclusive and require each other. Based on these dependencies, it might be necessary to add method fragments or to indicate possible pitfalls during service provision by method fragments that cannot per se be combined with each other. After the project manager selects method fragments, the system combines these fragments into a holistic method. Therefore, the method fragments are transformed into an executable format as presented in the next section.

### 3.3. Transformation and generation of process models

For supporting employees in service provision, a workflow management approach is used. Thus, it is necessary to transform a method into an executable format. We use the Business Process Model and Notation (BPMN) which allows for using a wide-spread number of workflow management tools. An example for a BPMN process is shown in Figure 4.

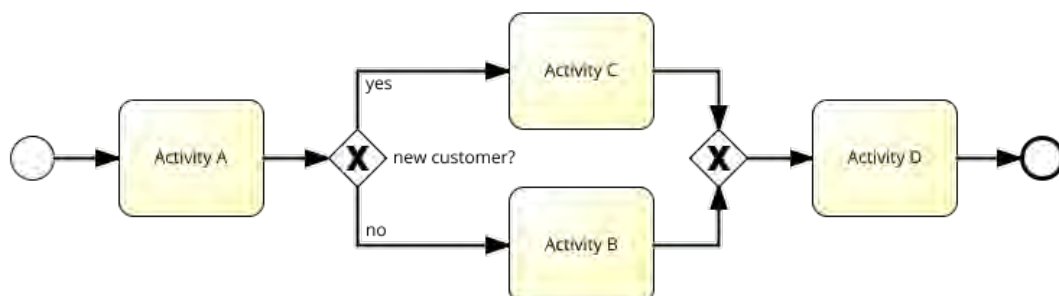


Fig. 4: BPMN example process

The most common elements of BPMN processes are *activities*, *control flows*, and *gateways*. Activities define process steps that must be performed. It is possible to distinguish between atomic activities for describing steps that are not broken down

and composite activities (*sub processes*) which allow for encapsulating activities with each other. The control flow defines the sequential order of activities. Gateways are used for splitting and merging the control flow. The example in Figure 4 contains an exclusive gateway. Using this kind of gateway, it is possible to define decision points in the process. In the example, a decision is made between new customers and recurring customers. In the case of new customers, *Activity C* is performed, otherwise *Activity B* is performed.

During transformation, every method fragment is transformed into an activity. A method fragment that has children, is transformed into a sub process containing the transformed child fragments as activities. An important aspect of the transformation is the representation of dynamic service characteristics. An example for a method fragment that is only suitable for a specific set of dynamic characteristics is the *Dialogue-based Customisation*. It is suitable only for customers with a high willingness to participate in the service provision process. To reflect this requirement, the respective activity is encapsulated in an exclusive gateway during transformation as shown in Figure 5. During process execution, the dynamic characteristics can be evaluated and, thus, the appropriate control flow is selected.

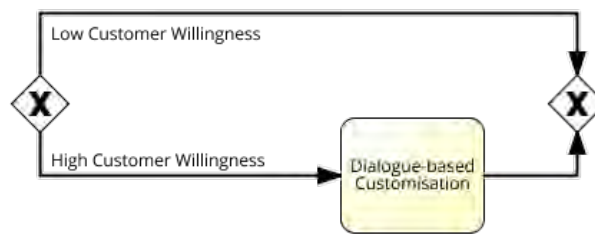


Fig. 5: Transformation of dynamic dependencies

Figure 6 provides a snippet of a transformed BPMN process. In the example, method fragments of the implementation phase are shown. In the upper section of Figure 6, the *Module-based Customisation* sub process is shown. It contains the activities *Subtractive Customisation* and *Additive Customisation* as children, connected with a gateway that evaluates a dynamic characteristic. The lower section of the example contains the *Dialogue-based Customisation* with the evaluation of the dynamic characteristic as described above.

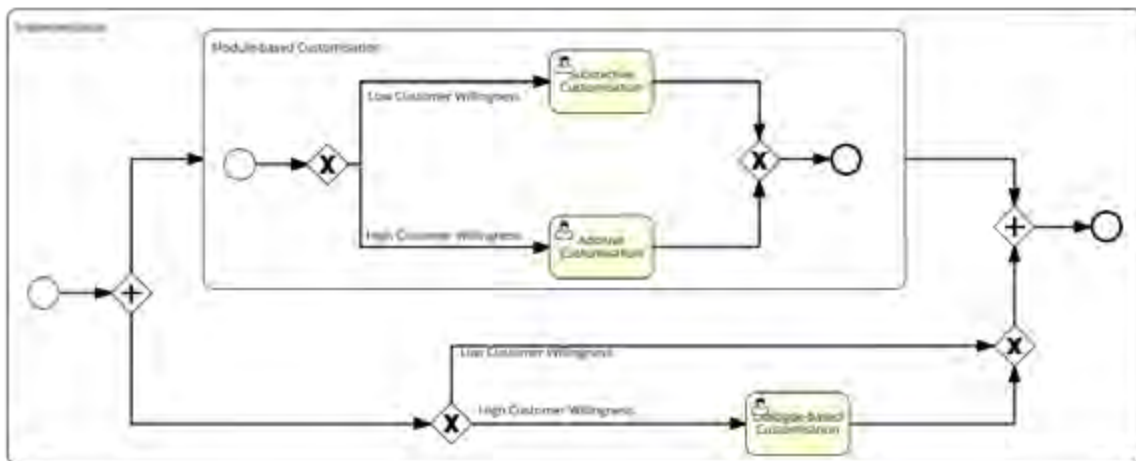


Fig. 6: Snippet of a transformed BPMN process

## 4. Method Fragments

The central contents of the method base are the method fragments. To establish method fragments, we identified existing service engineering concepts from academic literature with a focus on service customisation (Becker & Klingner, 2017). In addition, service characteristics were identified using a structured literature review (Becker, et al., 2011). While service engineering concepts describe the content of method fragments, service characteristics are used to define appropriate context factors of method fragments. In total, 82 service engineering concepts and 23 relevant service characteristics were identified.

Method fragments are established by aggregating concepts and assigning relevant characteristics. In the following, we give an overview about method fragments grouped by the service engineering phase according to DIN (1998) in which they can be applied<sup>3</sup>. The overview contains the definition of the goal of a method fragment and a description of the content. In addition, roles and responsibilities as well as dependencies to other method fragments are presented.

To simplify definition of method fragments, a variety of possible dependencies between method fragments were specified and are shown in Table 4. Using these dependencies, the system automatically validates a selection of method fragments. All the presented dependencies in Table 4 have inverse relations, too. For example, the inverse dependency of *requires* is *is-required-by*.

Dependency	Description
<b>Requires</b>	Method fragment A requires method fragment B: If method fragment A is selected, method fragment B needs to be selected, too.
<b>Excludes</b>	Method fragment A excludes method fragment B: If method fragment A is selected, method fragment B must not be selected.
<b>Has Children</b>	Method fragment A has children B and C: Appropriate situations of method fragment A are appropriate situations for method fragment B, too. It is possible to further restrict appropriate situations by specifying appropriate values for characteristics.

Table 4: Dependencies between method fragments

Besides dependencies between method fragments, we defined roles for specifying responsibilities using RACI matrices. The roles were established based on primary and support activities of companies according to Porter (1989). Roles of primary activities are responsible for provision and marketing of services. They consist of the categories *inbound logistics*, *operations*, *outbound logistics*, *marketing and sales*, and *customer service*. The roles of the secondary activities are supportive and consist of *infrastructure*, *human resource management*, *technology development*, and *procurement*.

<sup>3</sup> A complete and thorough list of method fragments is presented at <http://serviceconfiguration.org/methodfragments>

#### 4.1. Method fragments of the phase Idea Generation

<b>Modularisation</b>	
<b>Goal</b>	Specify innovation approach
<b>Description</b>	With modularisation, an innovation is prepared by decomposing existing services into separate parts of a service. Since services are often organically grown, it is necessary to identify core values and additional extending parts. The decomposition results in modules which allow for individual innovation projects.
<b>Responsibilities</b>	Responsible: technology development; Accountable: operations; Consulted: infrastructure, inbound logistics, outbound logistics, marketing and sales; Informed: operations
<b>Modularised Development</b>	
<b>Goal</b>	Specify innovation approach
<b>Description</b>	A new service is modularly developed. This is achieved by decomposing innovation ideas and allows for separate evaluation and development of ideas.
<b>Responsibilities</b>	Responsible: technology development; Accountable: operations; Consulted: infrastructure, inbound logistics, outbound logistics, marketing and sales; Informed: operations

#### 4.2. Method fragments of the phase Requirements Analysis

<b>Define User Personas</b>	
<b>Goal</b>	Describe customers
<b>Description</b>	A user persona is used to define an ideal customer. Using this description, it is possible to anticipate the variation spectrum of possible customers and, thus, define customization rules in advance. User personas can be used to enrich variation points with customization suggestions.
<b>Responsibilities</b>	Responsible: technology development; Accountable: customer service; Consulted: customer service, marketing and sales; Informed: customer service

#### 4.3. Method fragments of the phase Design

<b>Define Variation Points</b>	
<b>Goal</b>	Describe service variability
<b>Description</b>	Fixed variation points for service provision need to be defined in advance. Therefore, it is necessary to analyse existing service parts for permitted and potential variances. Based on this analysis, the variation spectrum of a service can be described.
<b>Responsibilities</b>	Responsible: technology development; Accountable: operations; Consulted: inbound logistics, operations, outbound logistics, marketing and sales; Informed: marketing and sales



<b>Define Influence Factors</b>	
<b>Goal</b>	Describe service variability
<b>Description</b>	To customise services according to individual customer needs, it is necessary to know external influence factors. In general, influence factors cover aspects like the location of a service provision or customers' hardware. In addition, service-specific influence factors like weather aspects or media types might be relevant.
<b>Responsibilities</b>	Responsible: technology development; Accountable: operations; Consulted: inbound logistics, operations, outbound logistics; Informed: operations
<b>Define Service Modules</b>	
<b>Goal</b>	Describe services
<b>Description</b>	A service module is a logical and functional encapsulated component of a service. A complex service is made up from different modules and the portfolio of a service provider consists of service modules and interaction effects. Examples are logical and temporal dependencies or customer influence possibilities between these modules.
<b>Responsibilities</b>	Responsible: technology development; Accountable: operations; Consulted: inbound logistics, operations, outbound logistics; Informed: infrastructure, customer service
<b>Define Resources</b>	
<b>Goal</b>	Describe services
<b>Description</b>	Resources allow for estimating costs and limitations of service provisions. It is possible to distinguish between different kinds of service resources: resources provided by the provider (e.g. the car of a car sharing offer), resources provide by the customer (e.g. a driver's license), and resources provided by external parties (e.g. parking spaces for the car).
<b>Responsibilities</b>	Responsible: technology development; Accountable: operations; Consulted: inbound logistics, operations, outbound logistics; Informed: infrastructure
<b>Define Dependencies between Service Modules</b>	
<b>Goal</b>	Describe services
<b>Description</b>	Various modules of a company portfolio can have different dependencies between each other. Logical dependencies allow for defining compatible and incompatible combinations of service modules. In addition, it is possible to define logical dependencies between attributes of service modules. Using temporal dependencies, the execution order of service modules can be restricted.
<b>Responsibilities</b>	Responsible: technology development; Accountable: operations; Consulted: inbound logistics, operations, outbound logistics; Informed: infrastructure
<b>Define Service Attributes</b>	
<b>Goal</b>	Describe services
<b>Description</b>	For a thorough description of service modules, it is necessary to define attributed and possible values of these attributes. Using this definition, it

	is possible to distinguish between different alternatives. For example, services may differ in processing time or hard disk capacity.
<b>Responsibilities</b>	Responsible: technology development; Accountable: operations; Consulted: infrastructure, inbound logistics, outbound logistics, marketing and sales; Informed: marketing and sales
<b>Dependencies</b>	Requires: Define Service Modules; Is required by: Attribute-based Customisation

#### 4.4. Method fragments of the phase Implementation

<b>Dialogue-based Customisation</b>	
<b>Goal</b>	Customise services according to individual customer demands
<b>Description</b>	Using dialogue-based customisation, a service is customised before service provision. Therefore, requirements of customers are elicited during interviews. Requirements are satisfied using existing variation points of services. Dialogue-based customisation is suitable when customers are not able to state their requirements precisely, e.g. because they are not aware about all details of their requirements.
<b>Responsibilities</b>	Responsible: marketing and sales; Accountable: customer service; Consulted: inbound logistics, operations, outbound logistics; Informed: customer service
<b>Module-based Customisation</b>	
<b>Goal</b>	Customise services according to individual customer demands
<b>Description</b>	Using module-based customisation, a service is customised according to individual demands by selecting an appropriate combination of service modules. Mandatory prerequisite for this approach is a modularised description of services and, this, the definition of service modules and dependencies between these modules. To increase the possible number of variations, service modules should be standardised. It is possible to customise services using this approach before service provision (by eliciting requirements and selecting appropriate modules) or during service provision (by dynamic selection of modules).
<b>Responsibilities</b>	Responsible: marketing and sales; Accountable: customer service; Consulted: inbound logistics, operations, outbound logistics; Informed: customer service
<b>Dependencies</b>	Requires: Define Service Modules; Excludes: Attribute-based Customisation; Has Children: Additive Customisation, Subtractive Customisation
<b>Additive Customisation</b>	
<b>Goal</b>	Customise services according to individual customer demands
<b>Description</b>	Additive customisation is a variant of module-based customisation starting with a base service. According to individual demands, customers add required modules to the base service and, thus, cover all their requirements.
<b>Responsibilities</b>	Responsible: marketing and sales; Accountable: customer service; Consulted: inbound logistics, operations, outbound logistics; Informed: customer service
<b>Dependencies</b>	Child of: Module-based Customisation

<b>Subtractive Customisation</b>	
<b>Goal</b>	Customise services according to individual customer demands
<b>Description</b>	Subtractive customisation is a variant of module-based customisation starting with a complete service containing all possible modules. According to customer demands, customers remove unnecessary service modules.
<b>Responsibilities</b>	Responsible: marketing and sales; Accountable: customer service; Consulted: inbound logistics, operations, outbound logistics; Informed: customer service
<b>Dependencies</b>	Child of: Module-based Customisation
<b>Attribute-based Customisation</b>	
<b>Goal</b>	Customise services according to individual customer demands
<b>Description</b>	Using attribute-based customisation, service modules are customised regarding specific values of their attributes. Thus, customers obtain identical modules with different attribute values. In particular, this allows for defining non-functional service characteristics. Using this approach, it is possible to establish different service quality levels.
<b>Responsibilities</b>	Responsible: marketing and sales; Accountable: customer service; Consulted: inbound logistics, operations, outbound logistics; Informed: customer service
<b>Dependencies</b>	Requires: Define Service Attributes; Excludes: Module-based Customisation; Has Children: Upward Customisation, Downward Customisation

#### 4.5. Method fragments of the phase Service Provision

<b>Customer-induced Customisation</b>	
<b>Goal</b>	Customise services according to individual customer demands
<b>Description</b>	Using this approach, a service is customised according to customer demands during service provision without any intervention by the provider. Customer-induced customisation is suitable for services with variations that are known in advance. For being able to customise a service on their own, customers need to be informed about variation points. This is enabled by advance information, e.g. sales interviews. In addition, an intuitive service process supports customers in customisation
<b>Responsibilities</b>	Responsible: marketing and sales; Accountable: customer service; Consulted: operations; Informed: customer service
<b>Interpersonal Customisation</b>	
<b>Goal</b>	Customise services according to individual customer demands
<b>Description</b>	The interpersonal customisation approach comprises customising the interaction of employees based on customer demands. This includes verbal, nonverbal, and emotional elements like used vocabulary, gestures, and intonation. Interpersonal customisation differs from customising the service product, since customers obtain the same services. This approach focuses on soft factors to increase perceived service quality. To apply interpersonal customisation, employees need to be able to estimate customer demands. Therefore, predefined user per-

	sonas might be used to identify possible stereotypes.
<b>Responsibilities</b>	Responsible: operations; Accountable: customer service; Consulted: customer service, marketing and sales; Informed: customer services
<b>Transparent Customisation</b>	
<b>Goal</b>	Customise services according to individual customer demands
<b>Description</b>	Using this approach, services are customised according to customer demands during service provision by the provider without any intervention by the customer. Transparent customisation is suitable when demands of customers can be estimated. In addition, regular customers are focused, since their demands are well-known.
<b>Responsibilities</b>	Responsible: operations; Accountable: customer service; Consulted: customer service, marketing and sales; Informed: customer service
<b>Rule-based Customisation</b>	
<b>Goal</b>	Customise services according to individual customer demands
<b>Description</b>	Using this approach, services are customised according to predefined rules. For doing so, customer data and explicitly defined requirements are used. Rule-based customisation needs a preceding definition of customer requirements and their influence on service provision.
<b>Responsibilities</b>	Responsible: operation; Accountable: customer service; Consulted: infrastructure, inbound logistics, technology development, outbound logistics, marketing and sales; Informed: marketing and sales
<b>Data-based Customisation</b>	
<b>Goal</b>	Customise services according to individual customer demands
<b>Description</b>	Using data-based customisation, customer data are collect during service provision. Based on these data, the next service provision is customised according to extrapolated requirements.
<b>Responsibilities</b>	Responsible: customer service; Accountable: operations; Consulted: operations, marketing and sales; Informed: operations, marketing and sales

## 4.6. Exemplary Usage

In the following, an exemplified complex service is presented. Based on the service description, characteristics are established and suitable method fragments are identified. In addition, the method fragments are integrated into a holistic method covering all phases of the service engineering process.

The service of *nutrient mapping* is an essential part of the so-called *precision agriculture* which aims at providing specific fertilisation recommendations for agricultural fields. Therefore, various soil samples are taken and nutrient maps are generated based on laboratory results. Using this approach, it is possible to minimise ecological impact of fertilisation usage and to reduce costs spent for unintended overfertilisation. The company already provides the service since a couple of years and plans to restructure it. Thus, service development starts from a green field.

Generating nutrient maps consists of the steps *order taking*, *scheduling*, *processing*, *post-processing*, and *map generation*. During order taking, the different service parts

are presented to the customer. On the one hand, electric conductivity is assessed using a soil scanner. This allows for dividing a field into different classes of cultivation conditions (e.g. simple, medium, difficult). On the other hand, soil sampling is provided to assess the nutritional values and to derive fertilisation recommendations. Scheduling the process involves communication with customers to clarify temporal and local conditions and to allow for an efficient service provision. Based on given conditions, field technicians are able to plan their travelling routes to different customers. Besides previously defined restrictions, it is also necessary to consider relevant conditions on a daily basis. For example, moist soil distorts measurement results and, thus, weather conditions need to be analysed. Post-processing includes documentation of realised labour. If customers chose soil sampling, it includes sending soil samples to laboratories for a thorough nutrient analysis. For selecting a suitable laboratory, regional availability and availability of analysis methods need to be taken into account. After analysis results are available, nutrient maps with fertilisation recommendations are generated manually with the help of specialised GIS applications.

The relevant characteristics of the soil sampling service are presented in Table 5. As stated above, the existing service will be replaced by a new service without any restrictions resulting from existing constraints. Amongst the most important characteristics of the service is the *customer interface* because customers have direct contact with their respective technician. Process flexibility is given by *existing variation points* resulting from the two different parts of the service and the various possible laboratories. In addition, *ad-hoc flexibility* is relevant due to dependency from different weather conditions.

Diversity of variations: narrow	Variety of versions: customisable
Local restrictions: bound	Degree of technology usage: low
Customer activity: passive	Predictability of variations: predefined
Decoupled provision: yes	Customer influence possibilities: low
Service goal: things	Flexibility: variation points, ad-hoc
Customer interface: human	

Table 5: Characteristics of the nutrient mapping service

Method fragments that are appropriate for the given characteristics are presented in Table 6. During design, a particular focus is on defining influence factors and external dependencies to counteract possible errors in service provision. Due to flexibility by variation points, the method fragment *Define Variation Points* is of special importance.

Phase	Appropriate Method Fragments
Idea Generation	Modularisation, Modularised Development
Requirements Analysis	Define User Personas
Design	Define a Bundling Strategy, Define External Dependencies, Define Dependencies between Service Modules, Define Service Modules, Define Attributes of Service Modules, Define Influence Factors, Specify Customisation Model, Define Resources, Define Variation Points

<b>Implementation</b>	Information Customisation, Module-based Customisation, Dialogue-based Customisation, Attribute-based Customisation, Gather Customer Data, Define Price Model
<b>Provision</b>	Customer-induced Customisation, Data-based Customisation, Group-based Customisation, Rule-based Customisation, Transparent Customisation

Table 6: Appropriate method fragments for the nutrient mapping service

In service implementation, the method fragments *information customisation* and *dialogue-based customisation* are of particular relevance. Information customisation allows for different promotion of the service based on particular user groups. For example, for ecologically driven farmers, the environmental aspects of nutrient mapping that allows a clear documentation of soil quality might be focused. In contrast, the cost savings by reduced fertiliser use might be focused for other companies. Dialogue-based customisation is suited because technicians have direct contact with customers and usually are well networked with them. Due to this fact, dialogue-based customisation is a good approach to stay in contact with farmers and to identify requirements of companies.

## 5. Evaluation and Future Research

For evaluating a design science research project, several evaluation methods can be used (Riege, et al., 2009). In the previous sections, we implicitly evaluated the research by *demonstration* and *prototype construction*. For demonstration purposes, the nutrient mapping service was presented. Based on the characteristics of this service, appropriate method fragments were selected. In addition, a prototypical information system was developed and presented in section 3 of this work. The prototype is publicly available<sup>4</sup> and allows for showing the general applicability of the presented approach.

Besides prototype construction and demonstration, we have conducted four workshops with experts from practice to evaluate the system. An overview about the companies of the experts is given in Table 7.

Case	Company Size	Domain	Position
A	<50 employees	Software Development	Management
B	<75 employees	Agriculture	Middle Management
C	<10 employees	IT-Services, IT-Consulting	Management
D	>500 employees	IT and Knowledge Management	Board Assistant

Table 7: Overview about experts participating in evaluation workshops

In general, we received positive feedback. Particular use cases mentioned by practice are company reorganisations and certifications, e.g. according to ISO 9001. Ac-

<sup>4</sup> <http://83.169.21.228:8080/methodbase-webmvc/artifacts>

According to the experts, a critical success factor for the system is the completeness of the method base. Currently, the method base only contains method fragments for customer-individual customisation of services. To increase the practical benefit of the system, method fragments that cover different service engineering aspects need to be integrated.

Experts also asked for a clear specification of the limits of the approach. In the case of highly customised or even individualised services, questions on how to use the system arose. Particular emphasis should be put on process flexibility, i.e. experts stated that it must be necessary to be able to adapt generate processes after transformation. Some minor improvement suggestions concern the user interface of the information system and the feedback given to the user.

The next research steps are planned according to the feedback given by the experts. As stated above, we are going to increase the method base by adding more and more method fragments. For including a wide variety of researches, we established a web portal with an overview of method fragments<sup>5</sup>. Future development of this portal will include a possibility to add and rate method fragments. In doing so, we expect to receive feedback from different research groups. Besides establishing new method fragments, a shared portal should also help in unifying service engineering terminology.

## 6. Acknowledgements

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<sup>5</sup> <http://serviceconfiguration.org/methodfragments/>

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# BENEFITS AND CHALLENGES OF PRODUCT SERVICE SYSTEM APPLICATION – A REVIEW

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*While in the past, especially manufacturing companies concentrated their resources on physical products, nowadays they see a need for differentiation from domestic and global competitors. However, most traditional businesses have difficulties to adopt this new paradigm of the value of services and the importance of a product service offering. Companies have to overcome several obstacles by adopting such business models. Therefore, the aim of this paper is to identify benefits, barriers and challenges of product service system (PSS) application and analyse them as a basis for the development of a PSS implementation strategy for companies and for the identification of future research need in this field.*

## 1. Introduction

Today's economy and new business models focus more and more on services as a value proposition. The customers increasingly value the utility of a good. Also, well-designed product service offerings have a high market potential since they are able to provide a unique utility for the customer and increase market entry barriers for competitors at the same time.

While in the past, especially manufacturing companies concentrated their resources on the development, manufacturing and sales of physical products, nowadays they see a need for change and a need for differentiation from domestic as well as global competitors. However, most traditional businesses and especially SMEs have difficulties to adopt this new paradigm of the value of services and the importance of a product service offering (Hsin & Ching-Fang, 2005). The concept of product service systems (PSS) provides an adequate theoretical background for the described trend towards a servitization of the economy (Vandermerwe & Rada, 1988). While different research communities observed and analysed the transition from products to services by using different terms, such as servitization (Vandermerwe & Rada, 1988), service-dominant logic (Vargo & Lusch, 2004) or product service system (Goedkoop, van Halen, te Riele, & Rommens, 1999; Mont, 2002a), the key message is the shift to a servitized economy. The term product service system originated from the Nordic School (Grönroos, 1996) and is mainly used in the European research community (Baines, Lightfoot, Benedettini, & Kay, 2009; Goedkoop et al., 1999; Manzini & Vezzoli, 2003; Mont, 2002a; Tukker, 2004).

Within the PSS community, this term was defined in different ways with varying emphases in certain topics. For this paper the definition of Wong (2004) is applied, which states that "Product Service-Systems (PSS) may be defined as a solution offered for sale that involves both a product and a service element, to deliver the required functionality." (Wong, 2004). Other popular definitions provided by (Baines et

al., 2007; Goedkoop et al., 1999; Manzini & Vezzoli, 2003; Mont, 2002a; Morelli, 2006; Tukker, 2004) show that definition foci are mainly put on the market proposition and customer needs as well as on the concept of system. By looking at other publications in the PSS field, the foci are many put on subjects, such as strategy, design, sustainability, production, logistic/networks or ICT (information and communication technologies) (Annarelli, Battistella, & Nonino, 2016).

Since it was forecasted, that those companies would be most successful, which will find ways to develop innovative services around their products to deliver a higher customer value as well as solving customer problems (Porter & Heppelmann, 2014), firms have to overcome several obstacles by adopting PSS business models. Therefore, the aim of this paper is to identify benefits, barriers and challenges in PSS application and analyse them as a basis for the development of a PSS implementation strategy for companies and for the identification of future research need in this field.

## **2. Research Methodology**

In the following sub-chapters, the methodology is presented. First, the research aim and the research questions are described. Afterwards the literature review process is presented in detail.

### **2.1. Research Objectives**

The aim of the presented research is to identify currently discussed benefits, barriers and challenges in product service system application and use. The results were gathered by conducting a literature review on several databases and search engines. The main focus of the paper is to answer the following research questions (RQ):

RQ1: What are benefits, barriers and challenges for PSS?

RQ2: Did benefits, barriers or challenges change over time?

RQ3: Are there any known barriers or challenges that are related to the company size? Are there differences in barriers or challenges for larger companies in comparison to SMEs?

RQ4: Can any special implications for PSS and digitalization in terms of benefits and challenges be found? Do they relate to company size?

### **2.2. Research Process**

The literature review was carried out in five steps, which included (1) the definition of the basic research parameters by applying the taxonomy by Cooper (1988), (2) the definition of the search terms and search term combinations for the database search, (3) the selection of the searched data bases, (4) the methodological application for findings analysis and (5) backward search for further information sources.

## (1) Definition of the research by applying the taxonomy of Cooper (1988)

**Table 1: Definition of the research**

Focus	The foci of the research are on research outcomes presented by scientists as well as on use-cases where practices, applications and lessons learned from PSS applications are described.
Goal	The goal of the research is the identification of benefits, barriers and challenges for companies in the field of product service systems as well as the identification of further research needs.
Perspective	The perspective of the analysis should be neutral.
Coverage	The coverage of the review is intended to be exhaustive with selective citation on the focused field of investigation.
Organization	The organization of the analysis is conceptually for the purpose of identifying same patterns in PSS benefits, barriers and challenges as well as selected unique approaches.
Audience	The audience of the review are general scholars as well as practitioners and service scientists.

## (2) Definition of search terms

Since the goal of the research was to identify benefits, application and adoption barriers and challenges of product service systems and servitization, the following search string was chosen to identify relevant literature on the searched data bases and search engines: “PSS” OR “Product Service System” OR “Servitization” AND “Benefits” OR “Barriers” OR “Challenges” OR “Trends”.

## (3) Search for publications on the following search engine/ database

The targeted publications were journal and conference papers from the following databases/ search engines: Science Direct, Springer Link and Google Scholar. Furthermore, the scope of analyses was limited to the first one hundred findings from each source. The last criterion was that the publication had to be accessible with a regular license for the database (which is mostly relevant for the Springer Link database). All 243 (Science Direct: 43 findings; Springer Link: 100 findings; Google Scholar: 100 findings; searched in May and June 2017) search results were analyzed by title and abstract. Books, doublets and non-relevant findings were excluded from the analysis.

## (4) Analysis of the search outcomes by using the concept matrix of (Webster & Watson, 2002)

All findings were implemented in a Excel file and the concept matrix methodology (Webster & Watson, 2002) was applied to them. Thereby the main research categories were “Benefits of PSS”, “Barriers of PSS” and “Challenges for PSS application”. By following these categories, the intention was to identify the future research challenges and to extract subjects for future research from the identified benefits and barriers.

## (5) Further search based on of the first analysis

If authors of the found articles cited other sources, which were not found by the initial database search, then those sources were also considered by the analysis.

### 3. Research Findings

Before analysing the findings, three thematic categories were defined which are: “Benefits of PSS”, “Barriers of PSS” and “Challenges for PSS application”. For this research, the categories were defined as follows: Benefits are factors, which favor and promote the adoption and application of product service systems. They encourage economic actors to offer, accept or support PSS-value propositions. Barriers are issues that may occur before or during PSS-application and which hinder a successful implementation or usage of the PSS. Challenges are factors, which are not as discouraging as barriers but still make a successful PSS-application difficult and therefore must be mastered.

#### 3.1. Benefits of product service systems

The following sections describe and explain the main identified benefits of PSS.

##### 3.1.1. Sustainability

Sustainability is one of the most often occurring benefit and for the authors of basic PSS literature one of the most important benefit of PSS as well as an essential target for the whole PSS application (Wise & Baumgartner, 1999; Goedkoop, van Halen, te Riele, and Rommens (1999); Manzini & Vezzoli, 2003; Mont, 2002a; Morelli, 2002; Tukker, 2004). Since the term PSS mainly originates from the Nordic school (Grönroos, 1996), those authors are the ones, who see it deeply connected with sustainability.

“Producers become more responsible for their product-services in case material cycles are closed. Producers are encouraged to take back their products, upgrade and refurbish them and use them again. In the end, less waste is incinerated or landfilled” (Mont, 2002a). Other authors (Baines et al., 2007; Beuren, Gomes Ferreira, & Cauchick Miguel, 2013; Krucken & Meroni, 2006; Stahel, 1997) also mention those benefits. Additionally Baines et al., 2007) argue that the services can be planned in unison with the product life cycle and those named factors all together can help to minimize the usage of scarce resources and help saving the environment. Those positive aspects can also increase the lifetime of a PSS (Pessoa & Becker, 2017). Another benefit is that PSS driven sustainability automatically tends to decrease the total amount of products by offering alternative ownership and use scenarios like product leasing, renting or sharing (Mont, 2002a; Tukker, 2004). Therefore, PSS may have a positive effect on the total number of goods. As well environmental improvement as societal benefit is mentioned by several authors (Brehm & Klein, 2017; Cook, Bhamra, & Lemon, 2006; Goedkoop et al., 1999; Manzini & Vezzoli, 2002; Mont & Plepys, 2003; Morelli, 2002; Neely, 2008). Environmental improvement in general is also a particularly named benefit by companies (Mont, 2002b). Furthermore, by applying PSS strategies and payment schemes, companies like Atlas Copco AB, Electrolux, and Gambio were able to “[...]develop more expensive, higher quality and more environmentally benign technology, which customers can afford as they are paying per unit of function not for the product [...]” (Mont, 2002b). They also have the tendency to develop a more sustainable approach to business in general (Cavalieri & Pezzotta, 2012). Additionally, though the shift of focus from product ownership to product usage, PSS tend to have the potential to uncouple environmental burden from economic growth (Lightfoot, Baines, & Smart, 2013; Tukker, 2004). Furthermore alternative

product use leads to reduction in consumption (Beuren et al., 2013, 2013; Li, Zhang, Li, & Tong, 2010).

### 3.1.2. Increase of market barriers to competition

Some authors state that PSS may have a positive impact on a company's competitive situation and can even contribute to establish of market entrance barriers. In 1988, Vandermerwe and Rada argued that a product-service-based build-up of barriers to third parties is advantageous. This is especially relevant, if third parties are mushrooming in between the firms and their existing customers. According to Vandermerwe and Rada (1988) this is especially true for markets that are complex, highly specialized and customized. It is also mentioned that PSS help to set up "[...] barriers to competitors by creating a customer-supplier intimacy and mutual dependence [...]" (Cavaliere & Pezzotta, 2012). They also "[...] safeguard market share by bringing the service component into the offer that is not so easy to copy [and they also] safeguard a certain level of quality that is difficult to change (product quality)" (Mont, 2002a). The argument, that services are difficult to imitate and therefore lock-out competitors and strengthen the firm's competitive situation is also mentioned by several other authors (Baines et al., 2007; Brehm & Klein, 2017; Matsumoto, Yang, Martinsen, & Kainuma, 2016; Oliva & Kallenberg, 2003). Moreover, PSS offerings "[...] can be a means of differentiation and provide a robust market defence to competition from lower cost economies, particularly in the manufacturing sectors where there is a high installed product base (Lightfoot et al., 2013)". This argument was also mentioned by Wise and Baumgartner (1999). But also general differentiation from regular competitors is a common argument (Beuren et al., 2013; Meier, Roy, & Seliger, 2010; Pessoa & Becker, 2017; Schenkl, Rösch, & Mörtl, 2014).

### 3.1.3. Intensified customer relationship and loyalty

Intensified customer relationship is one of the key benefits of product service systems. Services are good for relationship building with customers (Brax, 2005). Because of more intense relationships which include a greater insight into the customer's needs, customer processes and an information flow about the customer's specific preferences, a more tailored offering can be developed (Mont, 2002a; Mont, 2002b). These close customer relations finally lead to problem specific and customized solutions. The growth of customer-company relationships increases customer engagement and intimacy in the long run (Galbraith, 2002; Vandermerwe, Matthews, & Rada, 1989). This new relationship also stimulates higher trust and customer loyalty towards the offering company (Aurich, Mannweiler, & Schweitzer, 2010; Baines et al., 2009; Beuren et al., 2013; Matsumoto et al., 2016; Pessoa & Becker, 2017; Schenkl et al., 2014; Schultz & Tietze, 2014). A successful PSS can be identified by a lifecycle long customer-provider relationship. The longer the relationship lasts, the higher the generated profit from the cost intensive build-up of the PSS structures is (Meier et al., 2010; Pessoa & Becker, 2017). Finally, a good customer relationship can lead to the build-up of barriers and provide a competitive advantage for the offering firm.

### 3.1.4. Product differentiation

By competing in mass-markets, where technologies and products are commoditised, Cavaliere and Pezzotta (2012) see PSS as a tool for differentiation. PSS offerings also can help to provide market defence to competitors from low cost countries,

which is particularly important for the manufacturing sector (Wise & Baumgartner, 1999). Vandermerwe and Rada (1988) name the possibility to increase the level of differentiation as one of three reasons why manufacturing companies should move towards servitization (Neely, 2008).

### **3.1.5. Financial Benefits**

According to Baines et al. (2009) servitization in companies frequently occurs due to financial benefits, such as a constant revenue stream or a higher profit margin. The decrease of variability and volatility of cash flows throughout the product life can also increase shareholder value (Cavalieri & Pezzotta, 2012). Furthermore, services tend to encourage recurring sales and intensified customer contact, which then leads to opportunities for the offering of other products or services (Malleret, 2006; Mathieu, 2001a). Further advantages named in the literature are financial savings through closed loops in service oriented solutions (Mont, 2002b) or re-usage of formerly leased products (Mittermeyer, Njuguna, & Alcock, 2011).

Schultz and Tietze (2014) argue that services increase the value of a product because they are knowledge and technology intensive. By increasing the value for customers, they generate additional revenues (Barquet, Oliveira, Amigo, Cunha, & Rozenfeld, 2013; Brehm & Klein, 2017; Neely, 2008) and are often mentioned to generate a higher profit margin (Lockett, Johnson, Evans, & Bastl, 2011). Additionally, the created knowledge through service provision and customer interaction can be offered, in turn, as consulting or training services (Beuren et al., 2013; Mittermeyer et al., 2011).

### **3.1.6. Attachment of additional value to traditional products**

PSS enable the attachment of additional value to traditional products through the addition of customer value like financial services, upgrading or refurbishing services, or through the transformation to a truly integrated offering. By adding services, a company can extend the existing functionalities and thereby redefine its market proposition and gain new competitive advantages (Baines et al., 2007; Porter & Heppelmann, 2014; Sassanelli, Pezzotta, Rossi, Terzi, & Cavalieri, 2015). Moreover, additional value can be added throughout the lifecycle and can also contribute to a higher and more constant profit (Brehm & Klein, 2017; Laurischkat, 2013; Lockett et al., 2011).

### **3.1.7. Growth strategy in mature Industry**

Another important benefit for the adoption of a product service strategy is the opportunity for company growth through services even by competing in mature, stagnating markets. Furthermore, companies are able to find new business opportunities outside of their known market boundaries (Mont, 2002a; Mont, 2002b; Schenkl et al., 2014; Vandermerwe & Rada, 1988).

### **3.1.8. Better monitoring of products**

The monitoring of products during usage phase can be an advantage for both, the PSS provider and the user. The product performance monitoring during the product use (Barquet et al., 2013) is a good way to ensure product availability or a certain service level (which can also be defined by a service contract). By the generation of

product data, intelligent predictive maintenance concepts can be offered to the customer. Through the trend of digitalization, “Smart Connected Products” (Brehm & Klein, 2017) or also “intelligent, smart and connected” (Porter & Heppelmann, 2014) solutions are more and more available and offer a wide range of digitally enabled services which can be based on the possibilities of digitalization. For example, additional services which are enabled through interconnected and embedded systems allow to “[...] trace, track, monitor and control remotely the physical artefact creating [value for the customer or the provider] [...]” (Sassanelli et al., 2015). Here again, the provision of services generates direct or indirect customer interactions which support the customer-provider relationship through the PSS-lifecycle (Vasantha, Roy, Lelah, & Brissaud, 2012). The usage of information exchange with customers, users and other stakeholders during the PSS-lifecycle has also the benefit of being able to prolong the PSS lifespan (Pessoa & Becker, 2017).

### **3.1.9. Customer data use**

Today's and also future products tend to have more and more embedded ICT components and therefore allow a variety of new services to be integrated into a PSS and enable even more servitization (Neely, 2008). Those new PSS have the ability to generate a multitude of new datasets about the customer, the product and its use. By appropriate usage of the data, companies can develop new offerings which may be more beneficial for the customer, foster further innovation and improve the firm's position in the value chain and in the market (Beuren et al., 2013; Sundin, Ölundh Sandström, Lindahl, & Öhrwall Rönnbäck, 2009; Tukker & Tischner, 2006). If the producer retains the ownership of the product during the product life cycle, a constant data flow is more likely (Matsumoto et al., 2016). In sum, the technological benefits of data use can enable higher productivity, foster innovation, provide a source of additional revenues, reduce costs and financial risks and enable stronger customer relationships (Brehm & Klein, 2017; Meier et al., 2010).

## **3.2. Barriers**

The following sections describe and explain the main identified barriers for PSS adoption and implementation.

### **3.2.1. No existing market yet**

In some cases, a social system or infrastructure, which would accept a PSS scenario, must be found or, if not existing, created by the offering company. Further complexity is given, if stakeholders are involved (Mont, 2002a). A lack of market demand for PSS is a barrier identified by Mont (2002b) during interview studies with Swedish companies. She reports that customers have problems accepting the producer's new role as service provider and knowledge source (Mont, 2002b).

### **3.2.2. Close cooperation required**

For the provision of a PSS, a close cooperation with stakeholders and customers is often required. Therefore, trustful relationships or strong regulatory tools for this cooperation are essential. A further factor are the involved individuals, who must be equipped with a reasonable amount of power to make the relationships work. The final barrier for close cooperation can be information sharing and transparency be-

tween partners (Lightfoot et al., 2013; Martinez, Bastl, Kingston, & Evans, 2010; Mont, 2002a).

### **3.2.3. Sustainability trade-offs**

Since the PSS community has a strong focus on sustainability, trade-offs in this area seem to be crucial. As a study discovered, multiple use of a product does not automatically lead to less impact on the environment (Krutwagen & van Kampen, 1999; Tukker, 2004). As Mont (2002a) argues, the environmental impact of product service offerings depends to a significant degree on the overall circumstances, the contract arrangements and conditions of use. For example, leasing can foster the consumption of goods, which – under regular circumstances – the customer would not be able to afford and therefore would not have purchased in the first place or would have had postponed to a later date (Mont, 2002a). As leasing comes with a lack of ownership for the customer, it can lead to a non-responsible usage of the product and a subsequent higher environmental impact. Another argument for sustainability trade-offs are the total product using hours which may remain the same, no matter if purchased as a PSS or not. Hence, PSS do not have per se the ability to reduce material consumption by less produced units or a more constantly usage (Tukker, 2004).

### **3.2.4. Sustainability seen as slowing down time to market**

Making a product market ready is one thing, making it market ready and sustainable is something quite different. Therefore, some authors state, that the addition of environmental considerations to the product development cycle is often seen by companies as lengthening time to market. And even though partnerships with other firms that help to provide a PSS solution may reduce the needed time, the effort, developing a product and services which are explicitly environmentally friendly is considered to take longer (Mont, 2002a; Mont, 2002b; Stoughton, Shapiro, Feng, & Reiskin, 1998).

### **3.2.5. Change from short-term to long-term profit**

Traditional firms are used to sell a product and get a one-time payment. They sometimes offer a service option for maintenance or consulting services. Changing from a short-term profit to a long-term profit by offering an integrated solution is a new concept to them and therefore has some acceptance barriers. Furthermore, the point-of-sale becomes the point-of-service. And still, success is not guaranteed since also the traditional incentives and control levers do not work the same in service business (Martinez et al., 2010; Mont, 2002a). Manufacturing companies traditionally have little experience in the development and provision of services. Hence they have no experience with the setting of service-related goals and tend to set overambitious objectives and expect high returns too fast (Gebauer & Fleisch, 2007). Since service orientation often occurs as a response to financial difficulties, changed customer demands or strategic product differentiation needs (Gebauer, Friedli, & Fleisch, 2006), servitization brings new challenges for the companies. For example management of multi-year partnerships, management and controlling of long-term risk and exposure as well as the modelling and understanding of costs and profitability implications associated with (high) investment expenses of PSS (Neely, 2008; Pessoa & Becker, 2017).



### 3.2.6. Extended involvement with a product beyond point-of-sale

The extended involvement with a product is also seen as a barrier for PSS adoption and has a strong relation to the challenge of long-term profits. Since companies are historically used to end their involvement at the point-of-sale, the increased responsibility for the product is seen as a major barrier (Stoughton et al., 1998). Therefore many providers rather prefer to keep the status quo than to extend their involvement by introducing a PSS (Aurich, Wolf, Siener, & Schweitzer, 2009). Extended involvement leads to intra-organizational and inter-organizational changes (Mont, 2002a). Here all the involved partners have to adopt to each other (Pessoa & Becker, 2017). Ideally, producers offer an additional set of services, which delivers great value to the customer. Customers in contrast, have to adapt to the providers new services and its frame conditions (Rese, Maiwald, & Gesing, 2013; Tuli, Kohli, & Bharadwaj, 2007).

### 3.2.7. Shift in corporate culture and market engagement required

The shift in corporate culture is an essential factor for a successful transformation towards becoming a PSS provider (Beuren et al., 2013; Cavalieri & Pezzotta, 2012; Lightfoot et al., 2013; Martinez et al., 2010; Mont, 2002a; Mont, 2002b). For being able to deliver PSS, companies have to transform their corporate culture to a service-oriented culture (Brax, 2005). Here the company needs to create a shift in employees mindsets towards service-orientation (Neely, 2008). The target should be a 24-7 mindset instead of a 9-to-5 one (Brax, 2005; Gebauer, 2009). Hence, the sale of PSS requires a different skillset than selling just products (Tukker, 2004). For being able to tackle the employee and culture related shifting issues, the right human resource management is a further challenge (Matsumoto et al., 2016; Matsumoto & Kamigaki, 2013).

### 3.2.8. Ownerless consumption

In the late 1990s research showed, that customers did not seem to be as enthusiastic about ownerless consumption as it was expected (Mont, 2002a; Stahel, 1997). Success stories were limited to small market niches (Mont, 2002a). The task of private customer engagement was described as challenging (Mont, 2002b), because “the producer usually has five seconds or one line written on a paper to get the customers’ attention to a particular product service characteristic, otherwise the purchasing will be made according to their traditional criteria and preferences, in which price is most important” (Pettersson, 2000).

In later publications, the author’s opinions on this subject didn’t change much. A need for change in customer’s mindsets was detected, because still, many customers are emotionally attached to the products. Which – for the private sector – can be observed in automotive industry (Neely, 2008). Since customers are used to pay for the purchase of a product instead of paying for its use, the expected behavioural and cultural change may make customers uncomfortable adopting PSS offerings (Rexfelt & Ornäs, 2009). Also in the B2B market difficulties were detected because only few customers tend to outsource their processes to the provider and therefore the investment for the implementation of the needed infrastructure does not pay off without a certain degree of demand (Meier et al., 2010; Pessoa & Becker, 2017). Another problem for customer acceptance is the missing awareness of possibilities, which a PSS is able to offer to them (Baines et al., 2007). For overcoming this barrier, Brehm and Klein (2017) suggest companies to change their strategy from product-centric to

a customer-centric perspective (Baines et al., 2009) and especially to invest in durable customer relationships for the duration of the whole product life cycle (Laurischkat, 2013). To overcome this barrier is seen as challenging, because for some products, customers value owning things and having full control over them (Cavalieri & Pezzotta, 2012; Tukker, 2015).

### **3.2.9. Lack of knowledge about life cycle costs of product ownership**

PSS offerings can be perceived as expensive in comparison to a regular product purchase (Mont, 2002b; Schenkl et al., 2014). Therefore awareness for the life cycle costs of an offering must be raised on the customer's side, since they are often not aware about the life cycle cost of ownership (Sundin, 2009; White, Stoughton, & Feng, 1999). Examples like in the chemical industry show, that life cycle costs of a product can be multiple times higher than the price of the product itself (Votta, 2001).

### **3.2.10. High labour costs**

A high service level for service-oriented solutions demands trained workforce whose labour costs are quite high. Hence PSS offering requires a different skillset than product sales (Tukker, 2004), the switch of employee mindset (Neely, 2008) and expenses for continuous employee training are significant. High personal costs have an effect on total PSS offering price. Therefore, setting the right price and incentives is crucial for customer attraction. (Mont, 2002b; Tukker, 2004)

### **3.2.11. Integration problems**

Problems of integrating PSS and therefore the provider-integration into the customers processes may occur due to the required information, sensitive data-transfer or involved processes which are crucial for the customers firm (Mont, 2002b). By granting access to companies internal information, the customers perceived control may decrease and lead to a rejection of the PSS (Ng & Yip, 2009). To overcome this barrier, strong customer relationships and trust are required (Mont, 2002b).

### **3.2.12. Lack of care (customer side)**

When risk of ownership shifts from customer to provider, barriers for the provider may arise. Interviews with companies revealed that providers are concerned about the less careful use of products by the customer if they do not own the product (Kuo, 2011; Mont, 2002b). Furthermore products, which were rented, leased or shared instead of being sold in the traditional way, are getting returned prior to those which were sold traditionally (Matsumoto et al., 2016). That may have a negative environmental impact due to less responsible usage (Tukker, 2004).

### **3.2.13. Opposition of the personnel (provider)**

As changes are made in servitizing firms, resistance from internal parties may occur, out of several reasons (Baines et al., 2009). First, employees may not be aware of the potential value increase that can be delivered through services and the opportunities for the company (Barquet et al., 2013; Oliva & Kallenberg, 2003). Therefore, different opinions within the company can slow down the process (Neely, 2008). Second, by providing solutions, a network of suppliers, provider and customers is created

(Baines et al., 2007; Baines et al., 2009; Mont, 2002a). This new situation demands internal changes in organization and structure which can also cause resistance among internal stakeholders (Brehm & Klein, 2017).

### 3.2.14. Opposition of the personnel (customer)

A PSS business model brings also changes for the customer and its employees. Mont (2002b) describes a case where employee opposition arose, when a service provider entered the company's activities. In this case, the staff was afraid, that the service provider could take over their tasks and functions and consequently take away their job. Another example for opposition on the customer's side was recorded by a case study where an integrated offering was introduced to the customers company. In this case a "not invented here" mindset blocked successful implementation of the PSS (Martinez et al., 2010).

## 3.3. Challenges of product service systems

With the transformation to a PSS provider, companies as well as customers are faced with several challenges. As shown in Figure 1, challenges mainly occur on organizational level and in developing and delivering services and integrated solutions.

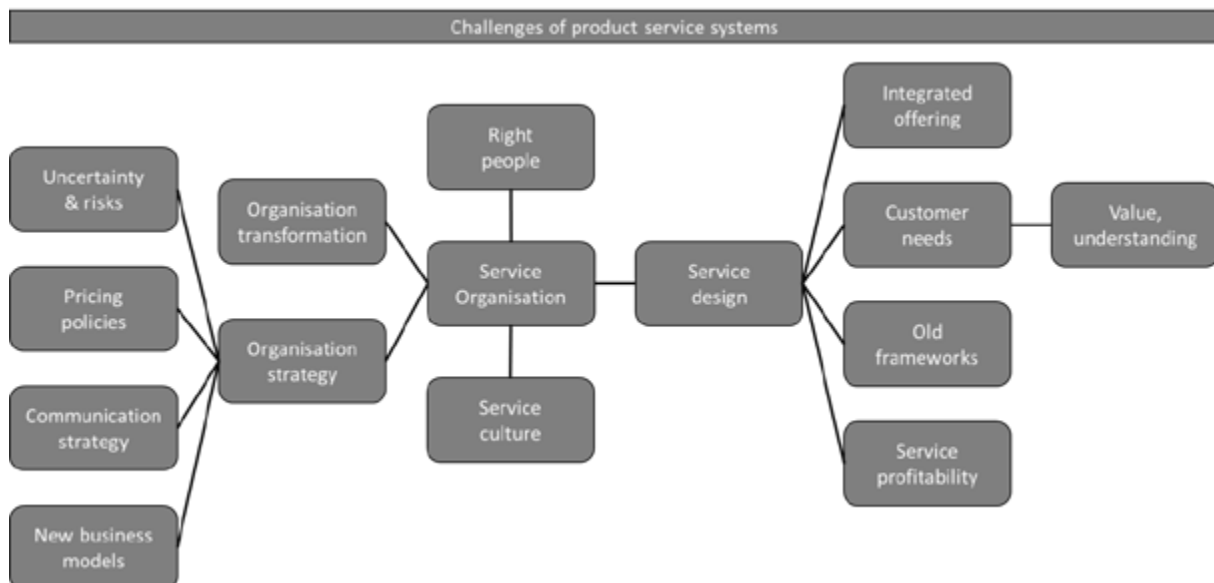


Figure 1: Challenges of product service systems

One important challenge is to build up a **service organisation** in which the **service culture**, the service values and the capabilities to design and deliver services are embedded (Gebauer & Fleisch, 2007; Neely, 2008). By doing so, a conflict between the product culture and the service culture can be avoided (Gebauer & Fleisch, 2007). By shifting from product- to PSS-provider, a mindset and cultural change within the company is required, which is different from traditional manufacturing culture and represents a passion for service (Brax, 2005; Martinez et al., 2010; Mathieu, 2001b, 2001a; Pessoa & Becker, 2017). Additionally, a mindset change on the customers side is necessary too, because both, provider and customer have to overcome resistance in order to provide a successful PSS with benefits for both parties (Kuo, Ma, Huang, Hu, & Huang, 2010). Since a PSS requires a different set of em-

employee skills than product development and sales does (Brehm & Klein, 2017; Tukker, 2004), there is a need to train or hire the **right people**. A further challenge based on the right employee subject is the strategic setup of the company's human resource management (Matsumoto & Kamigaki, 2013) which is a part of the overall company strategy.

As mentioned above, there is a challenge in developing a service culture that is implemented into a service organisation. Furthermore, capabilities for the ability to deliver services rather than products must be built up (Neely, 2008). Especially for manufacturing companies, the transition to a PSS and the **transformation** of structures and processes are important challenges (Baines et al., 2009; Gebauer & Fleisch, 2007; Gebauer & Friedli, 2005; Mathieu, 2001a; Oliva & Kallenberg, 2003). Research unveiled, that getting top level support might be challenging but is crucial for the strategic service transformation (Kuo et al., 2010; Mont, 2002b). Also, a person or a group of people who are excited about the topic are necessary to develop PSS concepts and promote them within the company (Mont, 2002b). The implementation of such a new organizational model as well as new business model leads to change-related challenges and must hence be reviewed and refined to overcome those (Barquet et al., 2013). Other challenges for this topic are a lack of strategic planning and a lack of an ideal management information system (Kuo et al., 2010).

Further, especially strategic challenges like uncertainty and risks, pricing policies, communication strategy and new business models must be overcome. The **uncertainty and risks** challenge deals with the transfer of product related risks from customer to provider (Azarenko, Roy, Shehab, & Tiwari, 2009; Meier et al., 2010). A good example for the transfer of risks is the case of leasing, where the provider has the financial risk burden and investment risk (Matsumoto et al., 2016). And since a PSS is often provided by a consortium of firms, there are quite complicated contract and revenue-sharing modalities (Tukker, 2015) which can question the success of PSS. A further challenge is the purchase and finally the **pricing of PSS**. The purchase process can be complicated and customers are not familiar with paying for a product function instead of the product (Pessoa & Becker, 2017; REXfelt & Ornäs, 2009). Therefore the focus of **communication strategies** must be on the description of the PSS value propositions which concentrate on the customer's needs (Mathieu, 2001b). Hence, the right communication of this issue is a further challenge, since traditional sales teams don't have the appropriate training for the sale of services (Gebauer, Fleisch, & Friedli, 2005; Tukker, 2004). For being able to transfer knowledge to the sales teams, companies need to have a clear understanding of current **business models** and the mindset and tools to explore possible future business models to create successful PSS (Barquet et al., 2013; Beuren et al., 2013; Lightfoot et al., 2013; Neely, 2008).

**Service design** is one of the most challenging subjects in PSS. Not just the service design itself, but also the provision of an **integrated offering**, the right understanding of the **customer needs**, **old frameworks** and concerns about **service profitability** challenge the adoption and implementation of PSS. According to Cavalieri and Pezzotta (2012) manufacturers are concerned about their lack of expertise with the design and delivery of services. Hence, services tend to be less well designed and non-efficient developed (Cavalieri & Pezzotta, 2012). The challenge here is an alignment and development of processes and frameworks for effective PSS development and provision (Martinez et al., 2010). For many firms, the transformation from a product to a PSS-provider is difficult, not well understood and a complex concept. Further-

more, in the literature, there is a lack for a process that targets servitization as a change process effectively (Martinez et al., 2010). Also Cavalieri and Pezzotta (2012) argue that manufacturing companies still use traditional engineering tools and frameworks for the development of PSS. Furthermore existing tools and methodologies for PSS design are typically rearrangements of the conventional tools (Cavalieri & Pezzotta, 2012) and will therefore hardly provide new results. Another challenging aspect for traditionally oriented companies is the understanding of **customer needs** and the creation of a value understanding for PSS on the customer's side. The firms aim should be, being able to read between the lines and understand the customer's thoughts ("[...]think like a customer [...]") (Martinez et al., 2010), the customer's view of the world, his/her existing preconceptions, the context the customer is in and what value is for him or her (Alonso-Rasgado, Thompson, & Elfström, 2004; Cavalieri & Pezzotta, 2012; Isaksson, Larsson, & Rönnbäck, 2009). Regarding the customer, there is a communication challenge to overcome a lack of market acceptance (Kuo et al., 2010) by convincing him/her of the **PSS value**, its potential and possibilities as well as benefits of ownerless consumption (Baines et al., 2007; Pessoa & Becker, 2017).

#### 4. Summary and Outlook

By applying the introduced research methodology, a review of benefits, barriers and challenges in PSS application was carried out and the findings were presented, which answered RQ 1. RQ 2 targeted thematic changes over time. The presented findings show not much change in topics except the trend towards digitalization in PSS and the increasing integration of ICT components into products as well as the development of smart connected products. Also, in times of digitalization, the subjects of better monitoring of products and customer data use are growing in importance. Another mentionable finding is that firms still don't seem to have big interest in ownerless consumption even though the private sector increasingly adapts to this concept.

For answering RQ3, Neely's (2008) findings are quite relevant. According to his conducted analysis, he argues towards a connection between a company's size as well as local circumstances and its servitization level. His findings also say that larger companies with more employees and higher revenues servitize more than smaller companies (Neely, 2008). This argument can be endorsed due to the fact that most of the success stories in PSS are about big companies such as Rolls-Royce, IBM, Shell or Canon. Neely's findings indicate several challenges for SMEs, meaning that having many employees and hence being able to delegate the research and development of integrated offerings to many people on a project basis stands in contrast to SMEs capacities and capabilities for the development of innovative integrated offerings. Therefore, SMEs tend to struggle with the development of own PSS.

Concerning RQ4, the literature argues that companies use old frameworks for the development of integrated offerings and therefore struggle with the results of their projects. Moreover, new challenges in terms of digitalization, product-ICT-integration and smart connected products arise. As mentioned in the last chapter, existing tools and methodologies for PSS design are typically rearrangements of the conventional tools and need a critical evaluation. Hence, there seems to be a need for a framework which offers methodologies and tools which can integrate product and service

design aspects as well as considering the challenges of digitalization and therefore help companies to develop digital product service systems (dPSS). Those tools should be designed to be easily usable, understandable and applicable in order to also support small and medium sized companies on the transformation path towards becoming a dPSS provider.

For future research, the analysis and assessment of available frameworks is needed. Thereby the focus of the analysis must be on the frameworks capabilities for service design, the integration of product and service to a solution and the applicability and usability of the framework for the target group. Furthermore, the applicability for SMEs is important since they need support for the transformation, which is a big challenge for them due to cultural, capability and capacity issues.

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# CAN SERVICE PROTOTYPING HELP MANUFACTURERS TO SERVITIZE?

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*In servitization, manufacturers need new methods and tools to design more customer-centred and service-oriented value propositions. This paper discusses the potential of service design ongoing prototyping when developing advance service offerings. Preliminary results suggest that service design ongoing prototyping presents benefits for fostering co-creation and previewing failures on service delivery. However, there are also limitations related to cultural barriers and when prototyping the complexity of the service offer as a whole.*

## 1. Introduction

As competition on their products grows, manufacturers have gain interest on servitization strategies (Baines & Lightfoot, 2013). Therefore, nowadays the transition towards more service-oriented offerings is evident in numerous industrial sectors (Lay, Copani, Jäger, & Biege, 2010).

However, even though servitization offers several benefits and lots of the leading manufacturers are making considerable profits from services (Roll Royce, GE, Xerox, Tetra Pack, MAN, etc.) in general servitization remains a risky movement for a manufacturing company. Servitization offers mixed results on its effectiveness (Visnjic et al., 2014) and implies significant challenges at cultural, organizational, operational, financial and technological levels (Zhang, & Banerji, 2017).

Among these challenges, researches such as Baines et al. (2017) have underlined the difficulty of manufacturers to identify appropriately customer value, including intangible attributes, and to design service value propositions accordingly. There is still a need to provide industrial companies with a shared language, methods and tools to design and develop advance service offerings (Martín-Peña & Ziaee Bigdeli, 2016).

In order to address these issues Calabretta et al. (2016), Iriarte et al. (2016) and Sangiorgi et al. (2012) suggest service design to support manufacturers on designing more customer-centred services. Service design provides a co-creative approach and visualization tools to aid service value proposition design in servitization. However, although service design is today an essential practice in the service sector (Andreassen et al., 2016; Yu & Sangiorgi, 2017; Zomerdijk & Voss, 2010) its applications on industrial contexts are promising but still rare (Bhamra, Moultrie, & Thurston, 2014).

This paper wants to contribute to our understanding on how service design can contribute to support manufacturers on servitization strategies. More specifically, our aim

goes beyond visualization tools and focuses on service design ongoing prototyping methods. This paper evaluates three ongoing prototyping methods (Desktop Walkthrough, Role-Play and Wizard of Oz) and suggests potentialities and limitations regarding future applications with manufacturers immersed in servitization processes.

## 2. Service design prototyping

Simochick et al. (2015) indicate the importance of service design visualization tools for value proposition design in servitization. Through Narratives and Images, manufacturers preview and create common understandings both internally and externally about the value of the intended service proposition long before the service is deployed. This means that from the organizational point of view, the use of service design visualization tools saves valuable development time as well as resources and costs.

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For example, in the early design phases, MONDRAGON group's servitized manufacturers (Iriarte et al., 2015) use Images (3D models of machines or facilities) along with Narratives (videos and storyboards of manufacturing operations) with their customers to show how the manufacturing turnkey solutions will operate. These high-fidelity virtual prototypes allow these companies to establish dialogs with the customer in order to refine and adapt the solution to their requirements, identify new needs and wants, and demonstrate the value of the turnkey solution from the first conceptual ideas (Danobatgroup, 2017; Fagor Arrasate, 2017).

However, we must recognize limitations in these visualizations too. Images and Narratives are not enough to prototype the value of the service offer as a whole, since they focus in certain touchpoints of the service offer. As Thoring and Mueller (2012) indicate, for specific complex socio-technical systems a graphical representation does not produce enough feedback to validate design or purchasing decisions.

According to Lusch and Vargo (2014) value is an experiential and contextual concept. While the producers and beneficiaries co-create value, the beneficiary alone evaluates it. The value of the service does not exist in a vacuum, but in relationships with people, objects and environments. Customer's value perception and experience change over time as it is influenced by different environmental factors (Buchenau, 2000).

From service design visualizations we can get prototypes which are representations that reach a stable state (artefacts, images, storyboards, videos, etc.). On the contrary, ongoing prototypes based on dramaturgy, do change and do not have a stable state. Blomkvist (2014) indicates that some immaterial aspects of the service cannot be understood without using ongoing prototypes (e.g. human interactions and social situations). According to Blomkvist since ongoing prototyping methods can represent time, ongoing prototypes not only embody the physical and functional characteristics of the service touchpoints, but also the relation between them.

In servitization, customers evaluate value according to their access to resources, their role/influence in the relationship, and the extent to which institutions are shared. In designing advance service value propositions, manufacturers must be aware of all these aspects (Baines & Lightfoot, 2013) and therefore they must develop ways of

previewing if what they intend to propose fits with what is perceived as valuable for the customer. Therefore, as mention in the introduction, the purpose of this paper is to make a first close up to discover the benefits of service design ongoing prototyping methods for the context of a manufacturing company in order to prototype the immaterial and relational value attributes of the service offer .

### 3. Methodology

We used a participatory observation for this study Jorgensen (1989). In a controlled environment, with the participation of design engineering students trained in service design, we tested three of widely used service design ongoing prototyping methods (Desktop Walkthrough, Role-Play and Wizard of Oz) for prototyping complex service systems. We selected the methods based on Blomkvist's (2014) research with design practitioners. Data was collected from the notes during the observations and afterwards, when reviewing the recordings of the prototyping sessions. Our conclusions are based on the discussion among the researches on the collected data.

### 4. Experimentation

Next, we briefly describe the prototyping methods used in the experimentation.

Desktop walkthrough is a prototyping method where participants imagine the ideal customer experience in a small hand scenario (Blomkvist, Fjuk & Sayapina, 2016). A characteristic desktop walkthrough involves a customer, a member of staff, an environment and some paper touch points (Engine, n.d.). LEGO pieces or other small "figurines" (Segelström, 2013) are used to represent people and other elements of the service, allowing exploration of interactions the customer have when moving around the small scenario.

Role-Play consists on a theatrical workshop where participants play different roles (e.g. customers, staff, and machines) in order to build empathy with customers and identify failures in service experience. Through Role-Playing, participants put themselves in a position to experience each character's emotions as they relate to a certain scenario (Thoring & Mueller, 2012). According to Thoring and Mueller Role-plays are used to: (i) evoke ideas based on the experience people have while they perform the scene, (ii) test specific design solutions, (iii) communicate design solutions to an audience, (iii) a Role-Play can be the result of the design process itself (e.g. a specific user experience), and finally (v) a Role-play can be used for training purposes as a simulation environment.

Finally, adapted from the human-computer interaction field, the Wizard of OZ is a prototyping method in which the participant interacts with a computer system that believe to be autonomous, but which is actually being operated by an unseen human being (Martin & Hanington, 2012). It is often used in rapid digital product development to improve the User Experience (UX). The prototyping session requires placing the participant in one place and the researcher who plays the system in another. In order to give an adequate response, the researcher must be able to observe the activity of the participants. As improvements are made to the tested interface, the need

for researcher intervention is diminished. Researches function is to keep the process moving and to bridge the gap between what the current implementation provides and the intended system will be (Buxton, 2017). It is especially useful when designing digital applications and solutions that do not have established design patterns (e.g. augmented reality systems and ubiquitous computing applications) (Martin & Hanington, 2012).

Table 1 describes the experimentations with these three ongoing prototyping methods previously described. The table lists the methods, briefly describes the context and the purpose of each experimentation, and suggests the potentialities and limitations for future applications in servitization. Table 1 is complemented with Figure 1, which includes one photograph representing each prototyping session.

**Table 1: experimentation with service design ongoing prototyping methods**

Prototyping method	Context & purpose	Potentialities in servitization	Limitations in servitization
<b>Desktop Walkthrough</b>	<p>To prototype the layouts of a candy shop.</p> <p>Participants were asked to create a small-scale mock-up for a new candy-shop. Participants must represent how a customer walkthrough the shop during the shopping journey.</p> <p>While representing the walkthrough, the participant playing the consumer was asked to verbalise what he is doing and thinking while completing the journey.</p>	<ul style="list-style-type: none"> <li>- Customer/user oriented service representation in a certain environment.</li> <li>- Co-creation of the manufacturing facilities (e.g. process layouts).</li> <li>- Training of employees.</li> <li>- Foster co-operation and co-creation both internally and externally.</li> <li>- Empathise with the service user.</li> </ul>	<ul style="list-style-type: none"> <li>- Cultural barriers and unfamiliarity with dramaturgical methods.</li> <li>- Time consuming.</li> <li>- Low-fidelity prototype. Useful only for the early stages of the design process.</li> <li>- Limited to a single physical environment.</li> <li>- Needs close relationships to be performed with customers.</li> </ul>
<b>Role-Play</b>	<p>To prototype the check-in of a new patient in a health clinic.</p> <p>Participants must play all the dialogs between people, as well as the interactions of the patient with machines and facilities.</p> <p>Observers could stop the performance and indicate or share problems while they register the action.</p>	<ul style="list-style-type: none"> <li>- Customer/user oriented service representation.</li> <li>- Simulation of the conversations between people (e.g. for customer phone support).</li> <li>- Enable to capture behaviours and subconscious fixations.</li> <li>-Foresee future situations and prevention of failures.</li> <li>- Training of employees.</li> <li>- Empathise with the service user.</li> </ul>	<ul style="list-style-type: none"> <li>- Cultural barriers and unfamiliarity with dramaturgical methods.</li> <li>- Time consuming.</li> <li>-Need of physical places where to go through it properly.</li> <li>- Low-fidelity prototype. Useful only for the early stages of the design process.</li> <li>-Training required.</li> <li>- Needs close relationships to be used with customers.</li> </ul>
<b>Wizard of Oz</b>	<p>To develop of a conversational bot for a Video on Demand (VoD) service.</p>	<ul style="list-style-type: none"> <li>-Faster learning processes (a way of keeping tacit knowledge of employees).</li> </ul>	<ul style="list-style-type: none"> <li>-Cultural barriers with dramaturgical methods.</li> <li>- Unfamiliarity with the</li> </ul>



	<p>Participants dialogued with the bot. The bot was played by one researcher who controls a conversational interface (including voice and image). The bot connects several users in different locations contemporaneously.</p>	<ul style="list-style-type: none"> <li>-Customer support service design of interfaces and its early evaluation (web/app).</li> <li>- Prototype different interfaces working with different users, through different devices and in different places contemporaneously.</li> <li>- Useful in both explorative and evaluative phases of the design process.</li> <li>- Empathise with the service user.</li> </ul>	<p>methods.</p> <ul style="list-style-type: none"> <li>- Time consuming.</li> <li>- Limited to digital interfaces.</li> <li>-Training required.</li> </ul>
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Figure 1: images representing different moments during the prototyping sessions

## 5. Discussion

This paper aims to be a first close up to the potential benefits of service design ongoing prototyping methods for a manufacturing company immersed in servitization. Based on our observation during the application of three of these prototyping methods, we believe that the use of ongoing prototyping may be beneficial for manufacturers in the early stages of service value proposition design process.

Our preliminary results suggest that ongoing prototyping methods may be used for enhance co-creation both internally and externally. On the one hand, the use of prototyping techniques enables participation of different employee profiles of the company. On the other hand, they may be used externally with stakeholders and customers.

Besides, ongoing prototyping can help previewing inadequate or problematic situations in customer relationships when delivering the service. They provide an easy-to-use way to empathise with the customer, and to preview in a conceptual way how the service will look like through its different touchpoints. In addition, by the use of ongoing prototypes, customer's chronological interaction with facilities, machines, interfaces and employees can be conceptually overviewed. This is especially interesting when introducing new human machine interfaces for the delivery of the service through different devices located in ubiquitous locations. Finally, ongoing prototyping it can be used for training as it creates simulated situations of future service moments.

However, we also believe that there are several concerns.

First, we anticipate significant cultural barriers. It may not be easy to implement these methods with technology-focus and product-oriented employees. Manufactures are not trained on these dramaturgical methods and they are not used to such co-creation approaches in their daily routines. As Rontti et al. (2013) warn, performing can be frustrating when participants are not used to it. Training and sensitization about the importance and usefulness of co-creation and service prototyping will be compulsory.

Second, ongoing prototyping methods should be performed in a predefined and systematic way in order to take real advantage. No method by its own is enough to represent the whole service value proposition. Aiming to represent the complexity of the complete socio-technical ecosystem of the service in a single prototyping session appears to be a difficult task to overcome. It seems to be reasonable to use a combination of prototyping methods within an established process.

Third, we believe that the preliminary evaluation of the time to be invested on the prototyping sessions and the balance between low and high fidelity prototypes is essential for the successful adoption of ongoing prototyping methods. Future applications with manufacturers must first put in clear the purpose and the expected outputs of the (combined) application of the ongoing prototyping method(s).

## 6. Conclusions an further research

Overall, we conclude that even though the immaturity of ongoing prototyping methods and the unfamiliarity of manufacturers with such dramaturgical approaches, ongoing prototypes present benefits to manufacturers and therefore the topic deserves more research. Next steps of the research should be focused on developing applications with manufacturers in order to evaluate these methods in real-life situations. In this sense, bridging service design prototyping techniques with gamification approaches could be a way to promote the adoption of ongoing prototyping by manufactures.

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# CHALLENGES IN INTEGRATING ASSISTIVE TECHNOLOGIES INTO ELDERLY-CARE SERVICES: COMPARATIVE STUDY BETWEEN JAPAN AND FINLAND

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*Aging population causes a global challenge in our society. While ICT and robotics are expected as potential solutions toward sustainable care, the technology integration process in elderly-care service systems is still cumbersome, especially in the international context. This study specifically focuses on facility care services in Japan and Finland. Through the interview with managers of facility care services in both countries, we clarified their expectation toward technologies and the barriers to integrate the technologies into care services.*

## 1. Introduction

Aging population has caused a serious, global challenge toward elderly-care service systems. Increasing public expenditure and limited human resources for care services have raised a question about the sustainability and quality of care services. Recently, ICT and robotic technologies have been actively developed and introduced to support care services and the life of the elderly (Sun et al. 2009, Obi et al. 2013, Sugihara et al. 2015). These technologies are expected as a potential solution to the challenges caused by aging. While a variety of technologies for elderly-care has been developed, introduction and integration of them into elderly-care services are still cumbersome.

This study specifically focuses on international contexts of technology use for elderly-care. Each country has its own care policy, management and culture for elderly-care (OECD 2005, 2013), which affects requirements for technologies and their integration process. The international comparison of care policies and practices have been conducted in many studies (OECD 2005, Campbell et al. 2010, Rhee et al. 2015). However, few studies focus on the impact of the differences among countries, concerning technology integration and diffusion in elderly-care service systems.

In this study, we aim at clarifying differences of elderly-care service systems in Japan and Finland, and their influences on technology integration and diffusion in elderly care services. Both countries have high ratios of aged population, and have already confronted challenges caused by aging (OECD 2013). Our specific focus is on facility care services. Although home care tends to be highlighted based on the concept of “aging in place” (OECD 2005), facility care also requires innovations through integration of new technologies to support the life of the elderly, especially with memory ill-

nesses and heavy disabilities. Through the analysis, the requirements and challenges of technology integration to different elderly-care service systems will be obtained.

The contents of this paper are as follows. In section 2, we explain the service system perspective as an analytical framework for the comparative study of elderly-care services. In addition, we introduce the overview of elderly-care policy and services in Japan and Finland. In section 3, we explain the research methodology and cases of this study. We present the findings from the interview study in section 4 and provide some implications and limitations in section 5. Finally, we provide concluding remarks in section 6.

## 2. Background

In this section, we first explain the theoretical framework we applied for the analysis of different types of elderly-care services and situations. Then we introduce general information about elderly-care in Japan and Finland.

### 2.1. Service system perspective

To analyse care services in different countries and to clarify the approach for technology integration to them, we adopted the service system perspective. The service system perspective we adopted is characterized with the following three features: multi-stakeholder interactions, socio-technical nature and institutions (Watanabe et al. 2016).

- Multi-stakeholder interactions

The studies on service systems highlight the importance of multi-stakeholder interactions in value creation processes. Integration of customers and external networks has been emphasized in realizing service innovations (Edvardsson; Olsson 1996, Sundbo 1997, Sundbo and Gallouj 2000). Gallouj and Weinstein (1997) theorized multiple stakeholders' relationship in service systems and an assessment method from their perspectives, as multi-actor framework. This framework has been adopted especially to public services and Public-Private Partnership. For example, Windrum extended this framework to social innovation processes (Windrum 2013, Windrum et al. 2016). Hyytinen (2015) also applied the multi-actor framework for the analysis of public-private collaboration in the sustainable energy domain in Finland.

Elderly-care services also include multiple types of stakeholders. Määttä et al. (2016) suggested a framework to represent the impact of technologies toward the service system based on the model of Edvardsson and Olsson (1996), as shown in Figure 1. This framework includes four stakeholders; the elderly, family, care personnel and care organization. Implementing new technologies such as ICT and robotics affects the whole service system including the aforementioned stakeholders. Thus, we adopted this framework in this study.

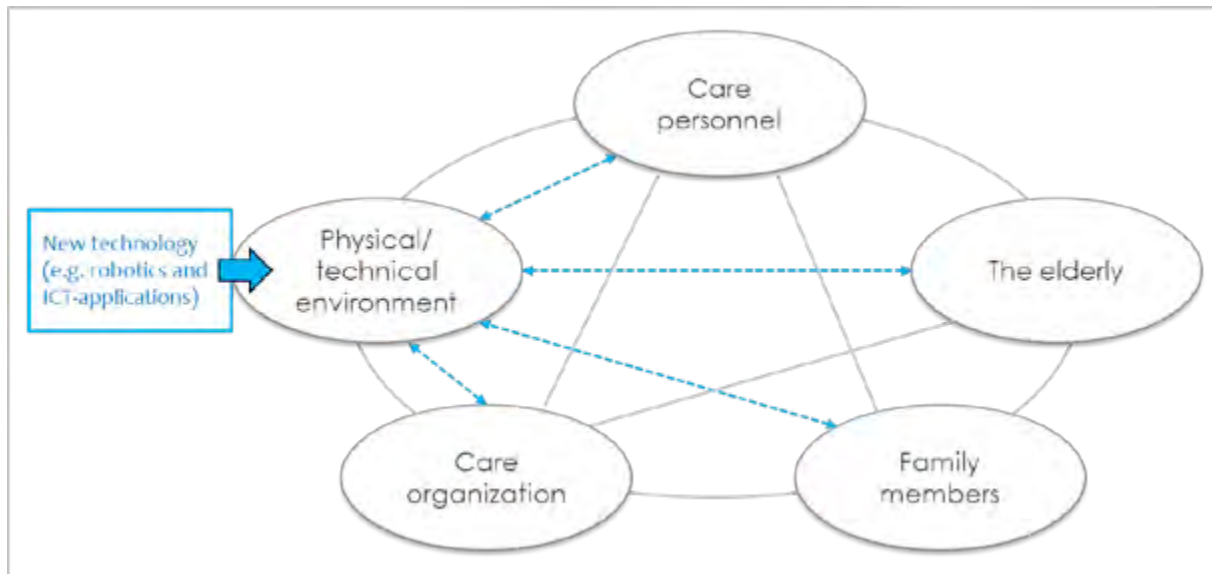


Figure 1. Elderly-care service system (Määttä et al. 2016)

- Socio-technical nature

In this study, we consider that technology is a part of human included systems, which create value. This socio-technical concept has been also traditionally adopted in the service innovation research. Edvardsson and Olsson (1996) state that technology is one of the resources to realize service systems. Sundbo (1997) emphasizes the stakeholders' innovative activities, which can be enhanced by ICT. Geels (2004) illustrates how the local innovative activities using new technologies can promote overall socio-technical change in the society. Hyytinen (2017) correlates this socio-technical view with service innovation processes.

Technologies are applied to service systems, which create value through interactions among stakeholders. In this sense, the socio-technical perspective is essential in this study to specify the role of technology in elderly-care service systems.

- Institutions

This study focuses on institutions in service systems, especially for the analysis from the international viewpoint. Scott (2001) illustrates institutions which “comprise regulative, normative, and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life.” Institution includes explicit and implicit rules, norms, regulations, customs and common behaviors. They affect not only organizational behaviors, but also value creation processes in service systems (Vargo et al. 2015). Akaka et al. (2013) specifically emphasize the importance of institutions in service ecosystems in the international settings. Since technology is a part of service systems, institutions could also affect the role of technologies in elderly-care services. We adopted institutions as a part of the analytical framework in this study.



## 2.2. Overview of elderly-care in Japan and Finland

Here we illustrate the overview of the elderly-care in Japan and Finland. Table 1 shows the summary of comparative features.

	Japan	Finland
Population (2012)	127.5 million	5.4 million
Ratio of 65Y over (2013)	25.1 %	19.9%
Expenditure for LTC per GDP (2013)	1.9%	1.4%
Service providers	Mainly private	Mainly public
Freedom of choice	Large	Small

Table 1. Characteristics of elderly-care in Japan and Finland

- Demographics

The Japanese population is 20 times more than the one of Finland. Concerning the aging situation, Japan has the highest ratio of the over 65-years-old population, 25.1 % in 2013 (OECD 2015). Although Finland has smaller ratio than this, it has already been almost 20%, which is higher than the average in EU, 18.4 % in 2013 (OECD 2015). Both are highly aged countries in the world.

- Elderly-care policy

Japan adopted Long-Term Care (LTC) insurance system, which activated in 2000. In this system, over 40-years-old citizens are mandatory to pay for premium, and the over 65-years-old citizens can be beneficiaries in principle to receive care services (Hayashi 2014). Recipients need to pay 10-20% of the care expense by themselves, according to their income. The total amount of insurance payment is determined based on the assessment held by municipalities. Expenditure for LTC per GDP in 2013 is 1.9% (OECD 2016) but the aging of baby-boomers will cause rapid increase of public expenditure, which could reach to 19.8 trillion yen in 2025 (Fujishiro 2015). Therefore, the reform of the care system has been continuously conducted to hold down the increase (Shimizutani 2013, Hayashi 2014).

Finnish elderly-care system is categorized in Nordic Welfare Model, in which universal services are provided by strong public sectors based on tax funding (Taperi et al. 2009). Care service is provided according to the assessment by a municipality. The main financial resources are subsidies from the government and taxation by local municipalities. Except the basic services, municipalities are also allowed to charge users directly. Expenditure for LTC per GDP in 2013 is 1.4% (OECD 2016), but the expected financial status is not at the satisfactory level. Therefore, the total welfare reform is being discussed (Alueuudistus 2017).

- General characteristics of facility care services

In Japan, facility care services (except residential services with home care and group homes for dementia) can only be provided by organizations authorized by prefectural governments. They are private, non-profit organizations (Hayashi 2014). The elderly and their family can choose any service in principle, although the elderly need a sufficient care need level for 24-hour care, which is determined by the municipal assessment.

While a municipality in Japan acts mainly as an insurer (Hayashi 2014), municipalities in Finland take more responsibility in providing services. There are both public and private services in Finnish facility care. However, even when private services are used, municipalities in general procure their services and provide them to the users (OECD 2013). Finnish municipalities basically decide required care services for the elderly, according to their assessment. Recently, a service voucher system has been adopted in large municipalities, which allows the elderly to choose services they need (Anttonen and Karsio 2016). However, the freedom of choice in Finland is as a whole smaller than in Japan. The on-going discussion of the social welfare reform includes expanding the freedom of choice for the elderly (Alueuudistus 2017).

### 3. Methodology

For this study, we conducted semi-structured interviews with managers in facility care service providers both in Japan and Finland. We conducted seven interviews in each country. Table 2 shows the summary of interviewee profiles.

Interviews in Japan were held in March-April 2016. Its preliminary result has already been reported (Määttä et al. 2016). Interviews in Finland were held in November 2016-May 2017. The interviewees were selected by the opportunistic sampling, but covered a variety of sizes and target care recipients (general care, care for memory illness) as shown in Table 2. Japanese interviewees were only from private organizations (including both for-profit and non-profit organizations), because Japanese facility care services are mostly provided by private sectors. In Finland, interviewees consist of both public and private organizations.

The interview time was 60-120 minutes. We took data from the interview notes, and also voice recording and transcription except two interview cases when voice recording was not applicable. The interview language in Japan was basically Japanese. The interviewer talked through a translator from this research project members. The interview languages in Finland were both English and Finnish. When the interviewee could communicate in English, we only used English. But when the interviewee was not fluent enough in English, we communicated with interviewees through a translator. We should note that this translation process might affect the quality of the interview results.

In this interview study, we especially focused on two points: (1) what kind of technology is being used or expected, (2) what kinds of challenges exist in integrating technologies into service systems for different types of stakeholders.

No.	Interviewee in Japan	No.	Interviewee in Finland
J1	Facility manager of a facility in a large healthcare and elderly care corporation (no voice recording)	F1	Executive director of a small non-profit organization operating a care home
J2	CEO of a large healthcare and elderly care corporation	F2	Executive director of a care home, owned by a foundation
J3	Managing director, a large healthcare and elderly care corporation	F3	Director of communication, a large international care service company
J4	CEO of a small group home for dementia	F4	Facility manager of a care home, operated by a large international care service company
J5	CEO of a large elderly care corporation	F5	Facility manager of a care facility for memory illnesses, operated by a municipality
J6	CEO of a small group home for dementia	F6	Facility manager of a care home for memory illnesses, operated by a company (no voice recording)
J7	Executive Head of a large social and welfare corporation	F7	Facility manager of a care home, operated by a municipality

Table 2. Summary of interviewee profiles

## 4. Findings

Here we listed our findings from the interview results.

### 4.1. Technologies in use

- Japan

In the interviews in Japan, some facilities had implemented different types of care recording systems, which were used especially for requesting insurance payment. The facility under the healthcare corporation had an access to the electronic health record (EHR) also. Another technology in use was a bathing support system. This is a semi-automatic bathing system, which supports care personnel to have the elderly who have difficulties in moving, take a bath safely. This is comparable to sauna which is implemented in almost every interviewee's facility in Finland, although sauna does not necessarily require specific devices to have the elderly get in.

- Finland

In Finland, most of the interviewees answered that they used ICT for caregivers to record results of care services and to communicate among the caregivers, in comparison with fewer use of such ICTs in Japan. Several interviewees answered that they used the common ICT tool to assess long-term physical and psychological change of their clients. Public facilities had an access to the EHR of the municipality which they belong to, but private facilities did not necessarily have an access to the municipality's system. Private facilities use the municipal EHR indirectly through the visiting medical doctors, and the facilities use their own messaging or care recording systems. A lifting device is another common technology used in the interviewees' facilities. One interviewee answered that her/his facility used a work scheduling software, with which caregivers can negotiate the change of their work shift with other caregivers.

## 4.2. Expected technologies

- Japan

In the interviews in Japan, reducing the burdens of caregivers was strongly emphasized. Technologies which can support the caregivers, such as wearable robotic lifting devices were mentioned as expected technologies, while the existing lifting devices were not highly evaluated. One interviewee said "...in Japan, most facilities, they don't use lifts...using lift could be better but, maybe it's not kind to elderly people. That's what many of my co-workers say." Meanwhile, one interviewee also said that the current robotic lifting device looked 'gigantic' and required improvement. As another supportive technology, monitoring and alert systems which can detect residents' movement at night and outgoing residents were taken up. In addition, one interviewee mentioned a mobile information sharing system for caregivers for daily reporting and knowledge sharing. Some interviewees show their expectation toward care robots, which can communicate with the elderly, such as "The residents get older and have more difficulty in doing something so, a lot of care is needed and caregivers and actually, a lot of, more communication is required for the elderly people but it's something difficult so in that case the communication robot do the effect."

- Finland

In Finland, systems to increase safety of residents such as a bed monitoring system were most commonly mentioned as an expected technology. This is the common technology expected in both countries. In addition, the interviewees in Finland generally preferred back-office technologies such as a logistics system inside a facility and an automatic work scheduling system. Meanwhile, several interviewees showed negative attitudes toward care robots which directly contact with the elderly. Some interviewees had already tried care robots in their facilities. One interviewee mentioned her/his experience as "...there's also the mental thing that like in Finland I would think that there would be a lot of discussion about the ethics, and also kind of like you get the, the robot is taking care of our elderly. In Finland that's a bad sentence." Meanwhile, one Finnish interviewee was very positive in care robot, even about the direct contact with the elderly.

	Japan	Finland
Technology in use	<ul style="list-style-type: none"> <li>- Care recording system</li> <li>- Electric health record</li> <li>- Bathing support system</li> </ul>	<ul style="list-style-type: none"> <li>- Care recording system</li> <li>- Electric health record</li> <li>- Assessment tool</li> <li>- Lifting device</li> <li>- Work scheduling system</li> </ul>
Expected technology	<ul style="list-style-type: none"> <li>- Wearable robotic lifting device</li> <li>- Monitoring and alert system (e.g. entrance, bed at night)</li> <li>- Information / knowledge sharing system</li> <li>- Communication robot</li> </ul>	<ul style="list-style-type: none"> <li>- Monitoring and alert system (e.g. bed at night, GPS)</li> <li>- Logistics system in a facility</li> <li>- Automatic work scheduling</li> <li>- Communication system with family members</li> </ul> <p>(Communication robot had more negative comments than a positive one)</p>

Table 3. Technologies in use and expected technologies in care facilities

### 4.3. Barriers to integrate technologies in care services

The interviewees mentioned potential and actual barriers to integrate technologies in care services as follows.

- Change in work

Some of the interviewees in both countries felt it a challenge to change the mindset of care personnel to use technologies at work. Integration of technologies in work causes the change of workstyles, which made care personnel reluctant to accept technologies, one interviewee in Japan stated. The reluctance to change the workstyle was mentioned in relation with the older age of care personnel in both countries, such as “Currently the average age of the employees is over 40. So, there are many 50s, 60s, and even 70s. For them it’s rather difficult to adapt to such kind of new technologies, and they are reluctant to change their working styles.” One interviewee in Japan mentioned another potential challenge which came from the lower educational background of caregivers. Meanwhile, one interviewee in Finland suggested that the intergenerational interactions had helped to introduce technologies at work. In her/his facility, the younger personnel taught how to use new technologies to the older, and the older personnel taught the experience in care to the younger, which made a good cycle in the workplace. Some interviewees in Finland mentioned that the manager’s positive attitude toward technologies would affect care personnel’s willingness to technology use.

- Immature technology

Immature technologies and their interfaces also affected the acceptability of technologies for care personnel, which was mentioned in both countries. In Japan, several interviewees mentioned that the time to use technologies was a challenge to overcome, especially about the use of the lift. There was also a comment from one inter-

viewee that the current robotic wearable lifting device was not also considered suitable to the care setting, as was written above.

- “Care-by-hand” culture

Another challenge is a “care-by-hand” culture. One interviewee in Japan mentioned that the mindset that care should be done by hand made care personnel reluctant to use technologies, like “...we, people who worked for this, area, tried to become more like a, family, or very warm-handed ... we have the.. cultural belief or, we tend to think that, doing everything manually or doing with the hand is very nice for elderly people.” The same kinds of arguments were stated in Finland also, but rather it was mentioned as the management policy from the aspect of humanity. In their view, human relationship should be highly respected concerning care.

- Public image toward robotics

One interviewee in Finland mentioned the public image toward technologies, specifically care robots, based on her/his experience. The interviewee depicted the image toward robotics in care as “... one trouble with robotization and with usage of technology because it’s not depicted as (warm), it’s not human, it’s.. like that. It’s cold, it’s.. violent, it.. in marketing way, bad.” This type of notion from the public viewpoint was not heard in the interview in Japan.

- Privacy

Although monitoring and alert systems for the safety of residents were expected in both countries, it was not necessarily preferred to use videos for monitoring. Some interviewees in Finland were negative about video monitoring, from the aspect of privacy. One interviewee in Japan also said, “there is some kind of a prevention of falling down, there are some systems that take the videos ... I’m against such kind of technologies, like to watch somebody or such kind of things...I don’t want to make, change the policy to keep the human to human relationship in a way.”

- Cost of technologies

From the managerial perspective, the cost for new technologies is a big barrier to implement them in both countries. Especially for the interviewees in smaller facilities, it is difficult to compensate the cost of technologies.

- Limited impact in management

One interviewee in Finland stated the investment toward technologies did not help management, because the number of caregivers required for services is fixed by law. This situation was the same in Japan. Meanwhile, one interviewee in Japan mentioned that increasing the work safety of caregivers with technologies would be beneficial from the managerial perspective.

Challenges	Main stakeholders	Japan / Finland
Change in work	Care personnel	Both
Immature technology	Care personnel, the elderly, family	Both
“Care-by-hand” culture	Care organization, care personnel	Both, with different views between Japan and Finland
Public image toward robotics	The elderly, family	Finland
Privacy	The elderly, family	Both
Cost of technologies	Care organization	Both
Limited impact to management	Care organization	Both, but with a positive view in Japan

Table 4. Barriers to integrate technologies in care facilities

## 5. Discussion

Based on the analytical framework, we provide some implications and limitations of this study.

### 5.1. Requirements and challenges from multi-stakeholders’ perspective

Regarding the technologies in use and the expected technologies, we were able to specify some similarities and differences between both countries. ICTs to record and share care information have been used, especially in Finland. In Finland, municipalities are responsible in providing services, so they can lead technology integration toward multiple facilities in their region. Meanwhile, there were some differences in technology use between private and public service providers. In Japan, facilities owned by private organizations need to take care of their own services, which might cause slower diffusion of standardized systems. For such service systems with different care management concepts, different strategies are needed to integrate and diffuse technologies. Especially, the municipality’s role requires further investigation.

Monitoring and alert systems for residents were mentioned as an expected technology in both countries. This implies that the safety of the elderly is a common issue for the managers in both countries. In addition, reducing the workload to watch over the elderly, especially in the night time is also important.

The interviewees in both countries shared many challenges about integrating technologies. This brings some expectations that a solution toward one elderly-care ser-

vice system could contribute to the other. Meanwhile, for example, different types of “care-by-hand” culture in Japan and Finland would require individual communication and implementation approaches adjusted to managers, care personnel and also the elderly and their families. The precise understanding on the stakeholders’ thoughts is important to configure such an integration process. The differences of the technologies in use and the expected technologies are also related to institutions in service systems. This will be discussed later.

## **5.2. Socio-technical challenge in integrating technologies**

The challenge for care personnel to change their work process when integrating technologies shows a typical socio-technical aspect in elderly-care service systems. The existing studies suggested that participation of stakeholders in both changing their processes and integrating technologies be a successful approach (Greenbaum; Kyng 1991, Wallin et al. 2015, Watanabe; Mochimaru 2015). This interview result suggested that the intergenerational support could be also a potential approach for smooth integration of technologies. This type of learning process is meaningful for overall workplaces and requires further investigation through the workplace study.

## **5.3. Institutions affecting technology integration**

This study revealed several institutional aspects concerning technology integration in the elderly-care service systems.

First, a culture in each country affects technologies in use. As shown in the Japanese case, bathing support technologies are common in care facilities in Japan, which comes from the Japanese bathing culture. Although bathing in a bathtub requires intense support with a heavy-loaded task for caregivers and also contains high risk in safety, it is unavoidable for Japanese care facilities to provide bathing services, because it’s an important part of people’s life. This type of cultural requirement should be taken into account when exporting technologies to another country, for example.

The “care-by-hand” culture is another interesting topic from the aspect of institutions. In the interview results of Japan, communication between the elderly and robots are expected, while introducing lifting devices is currently challenging. Meanwhile, not only the policy of Finnish managers, but also the public reputation could affect the acceptance to care robots, although lifting devices have been more accepted. The detailed analysis is needed to clarify these differences.

Laws and regulations also affect the integration of technologies. The regulation on the personnel quota for care could affect the motivation to implement technologies especially for private companies, because there is an expectation that investment toward technologies could contribute to their businesses. One interesting point is that Japanese interviewees have not mentioned this point directly, but rather stressed the benefit for work safety of caregivers. One potential reason of this is that the scarcity of caregivers is serious in Japan (MHLW 2015) and the improvement of work conditions is considered as an important management issue. Actually, the recent government-funded R&D for elderly-care focuses on reducing the burden of caregivers in care facilities (AMED 2016). This difference implies mixed factors including demo-



graphic difference, labour market, work environment and regulations, which could affect the direction of technology development policy.

#### **5.4. Limitation**

One of the important limitations of this study is that the interviewees are only managers in facility care services. To supplement other stakeholders' viewpoints, we have conducted other workplace studies and interview studies, and are preparing further analysis. As another limitation, there could be potential biases which come from the opportunistic sampling. In addition, further analysis is needed to evaluate the impact of each barrier collected through interviews when configuring an integration process of certain technologies.

### **6. Conclusion**

The focus of this study was on the difference in expectations toward technologies and technology integration approaches for Japanese and Finnish elderly-care service systems. For the comparative analysis, we adopted the service system perspective, which was characterized with multi-stakeholder interactions, socio-technical nature and institutions. The results of the interview study to managers of facility care services in Japan and Finland showed several common expectations and challenges, while the differences between Japan and Finland mainly stemmed from the different care management concepts, and cultural and regulation factors.

As the future study, we will analyze also more managerial aspects of elderly-care services in both countries. In addition, we will integrate and analyse data from other studies on municipalities, care personnel and the elderly to clarify the innovation process of elderly-care service systems through the integration of technologies.

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## CHALLENGES LINKED TO THE EXPERIMENTAL DEVELOPMENT OF PUBLIC SERVICES

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*This paper studies experimental development in the public sector. By integrating innovation and learning, experimentation aims to answer to the challenges of current innovation activities characterised by slowness and ineffectiveness. However, there are many challenges in adoption of these practices. This paper examines empirically the manifestation of these challenges in the context of a child and family services studied in a middle-sized Finnish city. The specific experiment focuses on the introduction of a new integrated model of wellbeing with the purpose of promoting multi-professional services and citizen empowerment.*

### 1. Introduction

This study examines the challenges of experimental development in the public sector. Experimental approaches have recently been suggested as a more successful innovation model than the traditional linear model, which is based on a highly formalized process. The problems of slowness, rigidity and insufficient effectiveness of this model have encouraged search for alternative ways to carry out innovation activities. It has been argued that experimentation corresponds to the conditions of modern society whose characteristics are continuous and rapid changes.

Experimentation aims to answer these conditions by applying the idea of the close relationship between innovation and learning. Several innovation theorists have highlighted the central role of learning-by-doing, learning-by-using and learning-by-interacting in innovation (Lundvall, 2001). Experimental approaches have also been linked to open innovation, which is one of the cornerstones of the modern views on innovation (Chesbrough, 2011). The approach of effectuation – another topical innovation theory – describes experimentation as a means-oriented process with expanding cycles of resources. According to it, adaptive trial and error is a more realistic way to tackle the uncertainties of future developments than strong pre-planning and systematic steps from ideas to pilots and to the launch (Read et al., 2009).

Experimental development has gained foothold in the public sector, too. There are, however, several specific issues in this context that create challenges to the adoption of experimental practices. Firstly, an important challenge emerges from the interlinkages between the goals of the national government and the strivings of local authorities. The experiments usually materialize at the local level, but are dependent on the national policies and politics. The aims of the governmental and local levels may differ or the dialogue between these levels may be insufficient regarding the aims. Secondly, at both levels, a challenge is the inclusion of the bottom-up perspective in the development, in addition to the top-down perspective that traditionally has dominated

the activities of public administration (Hartley, 2005). Thirdly, the dissemination of the results of experiments is challenging, because local actors have not resources for broader collaboration and they do not see dissemination as their task (cf. Moulaert et al., 2005). At the national level, experiments are often launched without an allocation of the responsibility and resources for the spread and broader application of the results. General models that would facilitate this application are rare.

In our paper, we examine the manifestation of these challenges in a case study carried out in Finland. In 2014, the Finnish Parliament accepted a law on experiment-based development in cities and municipalities for the years 2015-2016. The aims were to promote an experiment culture in Finnish municipalities, on the one hand, and to generate more efficient and effective services, on the other. We have studied the implementation of experimental development in a middle-sized Finnish city, in particular, but also interviewed ministerial representatives about the general goals and nation-wide achievements. The specific experiment that we focused on at the local level concerned the introduction of a new integrated model of wellbeing, whose purpose was to promote multi-professional services and citizen empowerment in social services for children and families.

We have structured our paper as follows. In the second section, we present the theoretical backgrounds of our study: the development from linear models towards more experimental approach in innovation and specific issues characterizing innovation in the public sector. In the third section, we describe the context of our empirical study and the methods of data collection and analysis. The fourth section summarizes the results. We have divided the results to those describing the views of the representatives of the local level (our case city), on the one hand, and to those describing the nation-wide perspective of ministerial representatives, on the other. The fifth and last section includes the concluding discussion.

## **2. Theoretical background**

### **2.1 From linear to experimental innovation models**

Models based on intra-organizational research and development (R&D) have dominated the discussion about the innovation process. The ideal has been a sequence of stages: idea generation, screening, evaluation, detailed development, testing and launch. The concept and practical realization of these stage models have been crystallized by the representatives of the 'schools' of NPD (New Product Development) and NSD (New Service Development) (e.g. Cooper and de Brentani, 1991).

The focus of the stage models has been the systematization of development processes, resulting in the increase of visibility of innovation efforts (Toivonen, 2010). The visibility has facilitated the creation of innovation indicators based on the resources allocated. Indicators are used at both the organizational and the policy level. In the latter context, a benefit has been the possibility to adopt systematic tools for innovation support and measure its amount. On the other hand, stage models are time-taking – a problem that was identified soon after their introduction as the norm and success factor in innovation. This problem was answered by a modification that is today generally applied: a parallel conduct of some stages (Alam and Perry, 2002).

However, there is an additional problem: in practice, the stage from which the innovation process begins varies and the end of one innovation process is often the beginning of the next. Several researchers have suggested that models of a spiral or circular type correspond better to the complex and recursive nature of innovation than a linear logic (Buijs, 2003). In order to make the stage model to answer better the reality, there has emerged a suggestion that the front-end of innovation should be separated from the later stages. It has been argued that experimental activity, which includes side steps and iterations, particularly characterizes the beginning of an innovation process. Through the separation of the front end, a synthesis has been pursued between creative problem-solving and rational planning (Koen et al., 2001).

Even this solution does not answer the basic challenge: the nature of innovation as a phenomenon whose result is not known beforehand. Engvall et al. (2001) point out that stage models have concentrated on the systematization of the form of the innovation process, but say very little about the content. However, it is just the content which is the main problem: the idea included is still immature and difficult to express in words. Constructing a plan for something which is not well-known and involves abundantly tacit knowledge is not a reasonable approach. More effective is a strategy which enables the creation of shared experience of the object to be developed. This means that planning and implementation should be merged to some extent.

Also several other researchers have questioned the idea that planning always occurs first and is followed by implementation. Moorman and Miner (1998) argue that 'organizational improvisation', which converges planning and implementation, is general in practice but often hidden behind a formal description of innovation processes. They identify three circumstances in which this approach is particularly important. First, unexpected stimuli may create the need for action without providing time for planning. Second, this approach might be prompted when planning cannot provide all the details needed in implementation. Third, a situation where much real-time information is available evokes immediate responses. Similarly, Eisenhardt and Tabrizi (1995) suggest experiential innovation with reliance on real-time experience: rapidly building intuition and flexibility are essential on the uncertain path of innovation.

The development of user-based innovation has progressed hand in hand with the non-linear thinking about innovation (Sundbo and Toivonen, 2011). Traditionally, users have been considered important as the source of needs-based information, and still today many organizations interpret user orientation as the gathering and storing of user information. The next step has been emphasis on the elaboration of this information into user understanding, which means that information is structured, interpreted and shared to make it applicable and link it to the organizational strategy (Nordlund, 2009). The actual involvement of users is an emerging trend. Central questions are who, when and how should be involved in innovation processes. There are approaches that highlight user interaction in the front end; other approaches emphasize the critical transition from development to implementation (Hasu, 2001).

The perspective of interactive learning in innovation highlights the users' role. The creation of shared experience of the object to be developed requires that both the users and the providers are understood to be innovators. Von Hippel's work (e.g. 1978 and 1986) during three decades has paved the way for this perspective. According to him, users offer more than an idea for a new product or service. They may provide an innovating organization with the identification of a problem or need, outcome-related specifications, or even a complete design of a product or service. In the

newer research, the continuation of the innovation process after the launch has been pointed out. Because novelties have different meanings for different user groups, they are often reinvented: actively interpreted and appropriated by users. Sundbo (2008) calls this phenomenon 'after-innovation'. He states that an innovation is not completed when it is launched, because customers cannot say beforehand what they want. They suggest ideas for improvements when they use the service in practice.

Along with the interest in user-based innovation, a question has been raised about the ways in which user experience could be made continuously flowing into the provider organization. The approach of employee-driven innovation highlights that front-line service workers have understanding on user needs based on the daily interaction. They can transmit real-life information and combine this information with their own ideas. However, the implementation of these ideas requires that the bottom-up processes are recognized and organized by the management. Managers should support employees by allocating resources, and they may also invite employees to participate in top-down innovation processes (Kesting and Ulhøi, 2010). At best, the impulses of users are communicated to the organization by grassroots employees in both practice-based and planning-based processes (Engen, 2016).

One interesting employee-driven phenomenon is 'bricolage' (Fuglsang, 2010). Theorization on employees as bricoleurs analyzes their role – not only in the transmitting of ideas – but also in their implementation. Bricolage includes a process of co-shaping an emerging path: various actors offer inputs and gradually build competences via learning by doing and interacting. The boundaries blur between design and implementation, and between rule making and rule following. The bricolage view suggests that in a situation characterized by resource constraints, employees may find innovative solutions based on 'whatever is at hand'. This notion is particularly important in public services which are often developed in the conditions of scarce – even diminishing – resources.

The approach of effectuation (Sarasvathy and Kotha, 2001; Sarasvathy, 2008) is near to the ideas of bricolage. Effectuation has its background in theories that highlight the significance of human resources, relationships, networks and institutions. It suggests the replacement of predictive logic with a means oriented approach to tackle uncertain environment and to co-construct novel solutions with committed stakeholders. The means oriented approach begins from available resources; goals emerge in the courses of action. An important point that the proponents of effectuation highlight is that any given resource can be made more or less valuable and more or less capable of producing long-term advantages: thus, what people do with resources matters. This approach clearly differs from the views that rely on linear processes, which start from the identification of an initial opportunity, set a goal, and aim to achieve it in a preselected context. (Read et al., 2009)

Expanding cycles of resources characterize the activities in effectuation. An essential part of iterative processes is adaptive trial and error. It is necessitated by the uncertain, systemic nature of current operational environments. In this kind of a situation, predictive information does not support decision making in the best possible way; more reasonable is relying on strategies that enable direct control, co-creation, and transformation of situations towards positive outcomes. Quickly realized small successes and small failures help avoid the risk that some action would put the entire effort in jeopardy. Preparedness to considering alternative markets and changes in



value propositions is a pattern that should be actively embraced, even if it necessitates a strategy change. (Sarasvathy and Kotha, 2001)

Even though systematic steps towards a predetermined goal are not an efficient way to tackle the unknown, an alternative approach must include enough structure to support the utilization of resources and to foster collaborative creativity. This can be achieved via framing the problem in hand comprehensively: using a framework or schema within which specific decisions and their linkages to other decisions can be contextualized. The ability to group problems into fundamental categories and relate them to other problems results in knowledge architectures that link multiple decisions in the task domain over time with feedback and interpretation. (Read et al., 2009)

## 2.2 The context of public services from the viewpoint of innovation

Public services face today the combined challenge of increasingly wicked problems and scanty financial resources. There is an on-going change in the intervention strategies of public management which reconstructs its responses to economic and social crises, weakened social links and the challenges of welfare state (Harrisson et al., 2010). In addition to incremental improvements that continuously emerge in public organizations, also systemic changes characterise the public sector. However, the concept of innovation is a 'newcomer' in this context (Windrum, 2008). The changes are usually called with other terms: 'reforms' or 'policy changes' (Christensen, 2012).

Researchers have also identified a larger, paradigmatic change in the way in which the nature of the public sector and public services has been understood. This change has taken place during the last thirty-fourty years and includes the transfer from the traditional public administration to New Public Management (NPM) and further to the emerging Network Governance (NG) (Langergaard, 2011).

The traditional administrative paradigm held a top-down view of the public sector, which was seen to be based on a bureaucratic and rule-based order. Services were authoritative pursuing equity but not providing users with possibility to influence (Torfing and Triantafillou, 2013). Changes were initiated top-down via legislation; parties played a central role in representing citizens' voice needed for the enactment (Hartley, 2005). The traditional paradigm held its dominance until the 1980s when the NPM paradigm was introduced. It brought market mechanisms to the public context: business-type management, lean processes, performance focus, and contracting-out. One of the most important ideas was handling the citizens as customers who have the right to require high service quality and free choice (Rhodes, 1996). NPM also meant that innovation was explicitly articulated as a goal (Langergaard, 2011).

The benefits of NPM are indisputable compared to the earlier bureaucratic view. On the other hand, also its limits have become apparent along with the development towards increasingly complex issues, multiple actors and need for open dialogue (Sørensen, 2002). Consequently, while NPM still has a strong position in the public sector, there is a new paradigm emerging: so-called Network Governance (NG). It highlights relationships and partnerships, and co-production as the service model (Newman and Clarke, 2009). Efficient intra-organizational processes are no more sufficient but the crucial issue is the empowerment of citizens. The emphasis on governance over government favors horizontally organized and relatively fragmented systems in which order is achieved through the regulation of self-regulating networks.

Currently, the NG paradigm evolves in parallel with market imitation and the still surviving elements of bureaucracy (Newman and Clarke, 2009). The co-existence of these fundamentally different views is not without contradictions. A central problem is the reconciliation of the top-down thinking, which is a typical element in the traditional administrative thinking, and the bottom-up views, which belong to the principles of NPM and NG. Contradictions between the top-down and bottom-up approaches are visible at both the organizational level and the policy level.

Several researches have analyzed the ways in which the approaches could be combined. An important suggestion is provided by Sørensen et al. (2013). They combine the top-down ideas of balanced empowerment (Sundbo, 1996) and strategic reflexivity (Sundbo and Fuglsang, 2002) with the bottom-up views of user-based and employee-driven innovation. The focus of the new model, called 'service encounter-based innovation', is on the bottom-up view but the earlier top-down analyses have been integrated to the whole. The model argues that the prerequisites for innovation are an organizational support system and a front office innovation climate. The former refers to structures and processes in the organization's back office and the latter to the employees' perceptions of their work environment affecting their creativity. The loosely coupled interaction structure, essential for idea generation in the model of balanced empowerment, is extended to include users in addition to employees; correspondingly, the intra-organizational context is extended to include the operational environment. The support system should help employees and users in disseminating and institutionalizing local innovations as an 'officially recognized' way of working.

According to Sørensen et al. (2013), several conditions favor the emergence of innovations in the service encounter. From the viewpoint of the organizational support system, confidence, correspondence capability, and decision capability are essential. Confidence means the trust of the management in the capabilities of the front-line employees and requires collaboration between different departments. Correspondence capability is based on suitable communication channels and sufficiently low hierarchy so that the views and ideas of employees and users flow freely and are recognized by the management. Decision capability includes the management's ability to choose ideas for further development or innovations for broader dissemination. The conditions influencing the front office innovation climate are entrepreneurial working values, social intelligence, and recognition incentives. Values should support the employees' will to solve problems of the users. Social intelligence enables employees to understand, observe, and take seriously the needs of the users. Recognition incentives highlight feedback regarding the 'destiny' of the employees' input.

The front office innovation climate is based on the creativity of employees and the organizational support system should both facilitate that creativity and integrate its results into the organizational goals. Creativity, facilitation and integration are interdependent and necessary in both practice-based (bottom-up) and directed (top-down) innovation processes. Significant innovation outcomes are most probable when different processes and practices of bottom-up and top-down meet each other (Sørensen et al., 2013). Saari et al. (2015) argue that very little is known about the activities and actors that make this 'meeting' happen. The authors suggest that the role of the middle managers is central, because they are positioned between the strategic managers and front-line employees and act as interpreters to both directions: concretize the managerial views and generalize the practical views. Middle managers also have the coordination responsibility which includes the application of various

coordination mechanisms – personal, impersonal, and group modes. More attention should be paid to concrete ‘management deeds’ in particular (ibid.).

### **3. Empirical context and methodology**

#### **3.1 Context of the study**

As mentioned in the introduction, our case context is the experiment-based development in Finnish cities and municipalities in the years 2015-2016. A specific law accepted by the parliament formed the framework for this development. More than thirty cities and municipalities participated in the project. Six topics were selected for experimentation: educational services, housing services, youth employment, collaboration of public authorities in social security, auditing of municipal operations, and an integrated model for wellbeing. Our study concerned the last-mentioned topic and its implementation in a middle-sized Finnish city.

The city focused its experiment on child and family services. The ‘integrated model of wellbeing’ included a life-cycle based total offering whose objective was reinforce the citizens’ ability to take responsibility of their own wellbeing and to support this development via multi-professional collaboration. The total offering consisted of social care (child protection and family counselling) and preventive and therapeutic services in the neighboring sectors: daycare, primary schools and health care. The novelties experimented were a digital platform as a mutual information and communication channel between citizens and different professionals, and a service plan to which both the customer and the professionals commit themselves. Empowering citizens to participate in the planning of services was also a target.

The integrated services were especially targeted to citizens who have multiple needs for social care and who therefore are in contact with different professionals from different sectors. The focus was on preventive services in order to diminish problems whose afterward relieving requires considerable resources. Four key processes were identified: early discussion about the concerns of citizens, high quality multi-professional collaboration, long-term support to the parenthood, and the development of social skills of both parents and children. These processes were concretized into life-cycle based and integrated service products. A management team including professionals from different sectors was established to take care of the implementation; appreciation of the views of grassroots employees was also encouraged.

A common service plan, which was a core idea in the experiment, aimed at collecting together the various plans that were made for the customer, each of them answering a specific need. The digital platform established aimed to facilitate the distribution of information: the professionals and the customer had access to one and the same information. They could also update and complement the service plan that was made in the electronic form and located on the platform.

#### **3.2 Data collection and analysis**

We applied semi-structured interviews as our main source of data: the topics were decided beforehand but within them, the respondents were given a great deal of freedom (Bryman and Bell, 2011). The interviews were carried out in two rounds. In the first stage, we interviewed the city managers and professionals who had partici-

pated in the experiment. In the second stage, we interviewed state representatives who had been developing the framework for the nation-wide project.

The main topics of the first-round interviews were: 1) the background of the multi-professional collaboration and its current stage in the child and family services, 2) the role of customers in the multi-professional service interaction, 3) the main elements of the new integrated model of wellbeing 4) the aims of the new model, concerning the digital service plan in particular, and 5) the managerial challenges linked to the new service practice and to the change pursued. We applied snowball sampling in the search for the interviewees: we interviewed first the manager of child and family services. Based on her suggestion, we thereafter invited other interviewees: 4 other managers and 18 professionals. Two managers represented educational services, one manager was responsible for the development of the digital platform, and one manager for the procurement of child and family services.

The interviews of the four managers were conducted individually. The professionals were interviewed in three groups. The first group consisted of five professionals from child protection, family counselling, and prenatal and child health. In the second group, seven professionals represented specialist day care, pre-primary education and therapeutic services (speech and activity therapies). While these two groups were specifically compiled for the interviews, the third group collaborated on a more permanent basis: this group with six professionals was responsible for the evaluation of customers' service needs. They represented family counselling, health services in primary education, day care, and team leaders of child and family services. The first-round interviews were carried out between October 2015 and February 2016.

The results of the first-round interviews revealed the challenging nature of the experiment; it was actually stopped before the end of nation-wide project. This made us interested in studying the reactions of the city management and the views of the governmental representatives who had been developing the framework for the municipal experiments and the respective law. Thus, we conducted seven new interviews: three interviews among city managers and four interviews among state representatives. The interviewed city managers were the head of education and welfare services, strategy manager and the manager responsible for customer processes. The interviewed state representatives were two ministerial advisers from the Ministry of Social Affairs and Health, and the head and a lawyer from the Office of Data Protection Ombudsman. The last-mentioned interviews were included because the sensitivity of family information had been continuously raised as an issue in the first-round interviews; the Ombudsman had also been involved in the preparation of the law for municipal experiments.

The second round interviews were carried out between November 2016 and February 2017. In the interviews, we focused especially on following topics: 1) the aim of the nation-wide experiment as regards the topic of integrated model for wellbeing, 2) implementation of the experiment; experiences of implementation, 3) impacts of experiment on local and national-wide systems 4) scaling up the experiment outcomes 5) continuation based on the results.

All interviews were recorded and transcribed. The analysis and interpretation of the data was conducted in a dialog between theory and empirical findings. The empirical observations were linked to the theoretical views of the article: the experimental approach in innovation and the specific issues of innovation in the public sector. We did

not use any computer-assisted coding tool, but several rounds of analysis were carried out to derive meanings from data and to reduce the amount of data (Huberman and Miles, 1994). While reading the interviews and the documentary material, we uncovered the most common and typical themes, and classified and structured them. In this way, we aimed at creating a holistic, systematic and thorough understanding of the research topic. The quotations in the results sections illustrate the level at which extracts were picked from the material. In the first round, the analysis results were presented to the city representatives who participated in the study; a workshop was organized to validate the results and to acquire supplementary information.

## 4. Research results

This section presents the main results of our empirical study. It focuses first on the implementation of the integrated model of wellbeing in our case city, highlighting the local actors' perspective and revealing several challenges that they experienced in this implementation. Second, we present the views of the governmental developers who were initiating the broader project on experimental innovation in the municipal context. In the reporting of the results, the citations of different respondents belonging to the same profession or position have been marked with A, B, C etc.

### 4.1. Challenges in the implementation of the experiment at the local level

The results revealed that the professionals participating in the change process had positive experiences about working with other professionals and they welcomed new possibilities in multi-professional practices. They wanted to break down organizational silos and also lower barriers between professionals and service users. The interviewees considered that an important positive effect of the new model and the related digital platform is the possibility to see information produced by the professionals of other sectors in common customer cases. The lack of common information ground had hampered the creation of an overall picture of customer situations and reduced possibilities to offer the best possible services. Without a common platform, the only ones who can combine information from various sources are users, but they do not usually know which pieces of this information are available to each professional.

However, the way in which the renewal was introduced caused problems. The idea of the new service plan was not co-created; only a few professionals participated in its development. Also the digital tool came 'out of the blue' to the practitioners – its preparation was in the hands of the management. Broader information was given only in three implementation sessions arranged by the management. Due to the tight timetable and professional priority on the customer work, many professionals had to skip the participation in these sessions.

*'We got an invitation yesterday to meet next week's Tuesday. We have arranged customer appointments two weeks ahead and it is very difficult to fix new times for the customers. You would need to call to customers and rearrange the meetings, which might have been cancelled and rearranged many times before. Sometimes I feel that these projects force me to abandon my primary work'. (Representative A of prenatal and child health)*

The professionals also considered that the experiment had generated new tasks and responsibilities that challenged their ordinary work. According to them, 'a never-ending flow of new tasks' decreases the face to face -time with customers. In the long run, the increase of the workflow may cause well-being problems.

*'The main problem is that there are always more and more responsibilities even though your workload is already full. New tasks are on the top of the former responsibilities. Nothing is taken away. A key question is how long you can increase the workload of professionals. Do we think that they can cope with all these new tasks?' (Representative A of specialist daycare)*

The professionals were also concerned about the experimental nature of the new model. They felt that the new model was again one experiment which will be tested and piloted but will not become a part of their daily practices. Thus, they had difficulties in motivating themselves to participate actively in the development process. Notably, this was not the only development project as the following quotation shows. The interviewees felt it problematic to identify which projects are genuinely impactful in practice and therefore worthy to participate:

*'There are many experiments starting; in the end, they do not affect any practices. Often these initiatives even stop before they have properly started... Initiatives come and go, come and go. And when you have lot of work, you can continue without realizing the effects of these experiments. It is very difficult to know in which experiments you should take part. Quite often when I have tried to participate and wanted to find out what the idea is in an initiative, the experiment has already disappeared.'* (Representative A of pre-primary education)

The interviewees also pointed out that the introduction of new digital platforms is time-consuming: it requires learning and patience both from the service providers and from the users. This time is taken away from the face-to-face customer contacts. In our case, an additional problem emerged from the fact that the platform had been developed separately for this specific purpose and hence it was not connected to the other ICT platforms that the professionals used. There were also technical problems in the implementation of the new tool. The interviewees highlighted that it is important that the digital tools work without problems right from the start to ensure the commitment of practitioners. The developers of digital tools should also take into account that there are workplaces (e.g. daycare homes) which do not have digital equipment. It is not self-evident either that all users (e.g. immigrants) have computers. Further, there can be mistrust towards new technology and fears about lost information.

Our study revealed that the expectations concerning the integrated model of wellbeing were very different between the managers and the professionals. The managers assumed that the new model would improve customer-centricity and the digital tool would make the work of professionals easier because it facilitates the access to information. However, it turned out that even the basics of the renewal were poorly known among the professionals. There were misunderstandings and the professionals did not know how the digital tool should be used in practice and what it meant for their daily work. The following two quotes illustrate the opposite views:

*'Multi-professional work is an established way of working in the city. A common service plan is a good tool to make this multi-professional work easier.'* (Manager responsible for the procurement of child and family services)

*'I have a very distant relation to this project and I do not know anything about it. I was not able to participate in the first implementation session in which the model and platform were presented. I have had a lot of work and [I have worked] also overtime hours so I have not had the time to ask my superior about this. I only received this invitation to the meeting [study workshop] – otherwise, this project is a total mystery to me.'* (Representative B of prenatal and child health)

One explanation, given by the manager responsible for customer processes was, that no one really took an overall responsibility of the actual development work. Various managers and professionals were involved in it, but the work was not coordinat-

ed and resourced properly. That caused parallel and divergent development processes, in which the professional did not share the same understanding and targets of the development. However, as his quote expresses, to enhance common targets it is requires that there is enough coordination and resources for the work:

*'To really enhance these project targets, it is requires that someone really concentrates on this work. We need someone to coordinate and to take overall responsibility of the development targets. ... Otherwise you can not see required results. In this current project idea for the development came from the city management but it was not delegated properly. There were five different managers who were involved in this development. However, it is not enough that five managers bustle around the same topic, if no one takes a real responsibility. If no one have resources or possibility to concentrate to the development work you cannot reach your targets and the quality of the work is not good.'* (Manager responsible for customer processes)

The aim of the new service plan was, with the help of the digital platform, to enhance information flow between professionals and professionals and citizens, and thus, to empower citizens. However, all the problems described above led to a situation that the recruitment of users was passive. The interviewed professionals told that they felt unsure and did not have all the necessary information to start recruiting citizens.

*'We did not have enough information to completely understand the concept. And because I did not understand it myself, it was not possible to market it to customers as a positive and good tool.'* (Representative A of therapeutic services)

The interview of the head of education and welfare services provided some explanations for the deficiencies and problems of the experiment. One of the problems was that the support from national level was insufficient and therefore cities were not able to create successfully new services. The issue is attached to discontinuity in policies. In this case, there was an election in the middle of the experiment and there were changes in the government. Due to these changes also the focus of policies changed effecting the experiment in some extent. Next citation describes how changes in government's political ideologies may affect dramatically on development programme emphasis and allocation of resources.

*'At the same time the government changed, the interest towards this experiment decreased. Of course the experiment did not stopped because it was planned beyond elections but the interest and resources went to new things.'* (Head of education and welfare Services)

The success of the experiment would have required changes in professionals ways of working. In a digitalized world, services are created in a way in which citizen participation is in essential role. That requires new competences for professional and ways of interaction, which has not been taken into account in this experiment. Therefore, also the citizen participation was low. Besides the challenges in collaboration, there were also other problems, which affected the citizen participation. For example, he customer group, which was selected to the experiment, was too demanding. The customers had multiple needs for social care and had therefore many contacts with different professionals. Moreover, their needs were difficult and sensitive, which is why they required face to face contact with a service coordinator; they did not have a substantial need for digitalized services. According to the head of education and welfare services, more successful strategy would have been to concentrate children and adolescents with mild problems. In this group digitalized platform with a common service plan might have worked better. The following citation illustrates these issues::

*'It might have required understanding from professionals about their new tasks: they should have been capable to help customers to use new digitalized services. Another issue is, that*

*we should have tried the common service plan first with the customer who did not have serious problems and many needs for care..’ (Head of education and welfare services)*

The experiment was based on an idea of the common service plan in which different plans were brought together and used in a single digital platform. However, the digitalized platform was not integrated with the other information systems of the social care, and technically it was very basic and traditional. In the other words, the platform did not promote the idea of an open data which is why it was in old-fashioned. The technical immaturity caused problems and hindered the implementation of the common service plan. The following citation describes this situation:

*‘In a way, we thought that we could take certain parts from the new digitalized world and implement them to a traditional way of providing services which is managed by professionals. It was a mistake because we created a closed platform and it didn’t embrace the idea of open data.’ (Representative of head of education and welfare services)*

Even though the common service plan was not implemented in the child and family services, the interviewees agreed on the usefulness and development potential of the idea. Like it was crystallized in one interview, central ideas of the experiment were very valuable and they will provide the basis for the development of child and family service in the future:

*‘Only effective and way to provide proactive child and family services is the multi-professional collaboration and service integration... And to support that development we need simultaneously integrated data systems instead of fragmented and inefficient systems. Currently we continue to use multiple irrational data systems, which is not the way to provide services in the future. In this experiment, we wanted to develop the comprehensive information reserve... Information reserve related to individuals capacity to manage their lives is the direction in which the data systems will develop in the future. (Strategy manager)*

Despite the generally accepted idea of common service plan, interviewees admitted that the actual experiment failed. The interviews of the strategy manager and customer manager provided thoughts in similar lines; these interviews took place in the end of the experiment and during the first two months after the end. They agreed that from the beginning the experiment was much too technology oriented and it was led top-down. Moreover, the middle managers and professionals were not sufficiently involved in the development work, which affected their commitment. However, the interviewees also underlined that the unsuccessful experiment was a valuable learning experience for all the actors involved in the development work: it made the actors to understand the main pitfalls in the process. The gained experiences are especially important for the service provision in the future social and health care centers, which are under a significant renewal in Finland. Like the manager responsible for customer process crystallized, the children and family services will be generated in the renewed social and health care model in accordance with the key ideas of the experiment:

*‘The service provision in the renewed social and health care centres bases on the same key ideas we had in our experiment. Due to the social and health care renewal, all the other municipalities are forced to develop their child and family services according to same model. They need to develop more integrated services. In our municipality, experiment helped us to generated preparedness for the future renewal.’ (Manager responsible for customer process)*

However, like it was underlined in the interviews, the learnings need to be seriously and constructively reflected so they can be seen as an asset in the future experimental activities.



## 4.2 Challenges from the nation-wide perspective

From the nation-wide perspective experimental development face many challenges, which, relates to their basic characteristics. According to the interviewed ministry advisors, one of the key problems is that practitioners do not understand the term 'experimental development' or its fundamental nature: experimental approaches have a close relationship with learning and therefore, for example, the trial and error should be allowed throughout the process. Practitioners are not familiar with this type of development, and therefore they do not typically have a clear understanding what implementation of an experiment requires from their organization. Like the interviewees described, if the definition and structure of the experiment is not clear, too much time and resources go to clarifying the terms and wondering the implementation of an experiment. The interviewees highlighted that in many cases poor understanding is manifested as an unplanned experimental project. In the other words, practitioners think that experimentation happens itself. . However, to accept the failures in an experimentation is not similar to unplanned development process. Instead, experimental development is about continuous learning and improvement, and therefore good planning and the capacity to learn from mistakes during the experimental project is necessary for the success. Like an experimentation process itself is not designed, neither is designed the learning from the results. According to the interviews, it is typical that no-one think about the dissemination of the results. However, the continuation of the experiment needs to be planned from the beginning and it should be integral part of the whole project. The following citations illustrate the challenges, related to the fundamental characteristics of experimental development:

*'The characteristics of [experimental] development include the possibility to fail. If something does not work then we can try something else. However, this [learning] requires capacity to cope with the errors, document them and make new plans.'* (Ministerial Adviser A, Ministry of Health and Social Care)

*'It's not clear what are the differences between experiments and pilots. Also, what happens after experiments' end should have been thought through... ..To carry out an experiment is one of the problems; too much time goes to clarifying the terms of an experiment.'* (Ministerial Adviser B, Ministry of Health and Social Care)

According to our interviews, one of the main challenges after an actual experimentation process is to implement its results and in accordance with them to create new services. Even though some experiments have overcome this challenge and have been capable of creating new activities, change happens typically in one single organization. In the other words, developed innovations affect typically individual organizations but are not diffused in wider scale in a service system. Therefore, the significant impacts which affect the entire service system are missing. Partially this is caused by the lack of learning structures at the policy level. Common structures do not exist because of the administrative silos and poor collaboration between the ministries. According to the interviews, every single ministry and municipality wants to "reinvent the wheel" and therefore they do not want to learn from the experiences of the others. Therefore, experiments are detached from each other and dissemination of good results and practices is not working. These problematic issues are illustrated in the next citations:

*'Traditionally the most difficult phase has been the step of implementing the project to the organizations and changing the activities.'* (Ministerial Adviser A, Ministry of Health and Social Care)

*'A tool for assessing customers situation has been developed, but the question is where it should be integrated or connected at the policy level. The lack of collaboration between ministries is the problem also... ..The problem in our social and health care system is that we have too many independent actors and organizations. These actors have a tendency of thinking that they are unique compared to other similar organizations. This is a similar situation in services and the problem is that every actor or organization wants to design the services by themselves whilst there is no need to reinvent the wheel.'* (Ministerial Adviser B, Ministry of Health and Social Care)

An important observation from the ministry interviews is the lack of leadership and management in experimental projects which is reflected in the relating regulation. Due to the above described challenges, professionals and managers at the local level are unsure about the implementation of experiments. Therefore, city managers call for very strict instructions from the ministries to support the implementation and management of experiments. However, attitude of professionals at local level is opposite: practitioners typically blame the existing instructions and feel that regulation diminish possibilities for collaboration between professionals. Therefore, they believe in 'free' and non-regulated development. Ministers, instead, favor enabling instructions instead of strict rules or non-regulated experimentation. They believe that enabling directions enhances innovativeness and, thus, creates opportunities to experimental development. According to the interviews, the divergent attitudes towards experiments' instructions reflect the general problems in social care legislation. The regulation in social services is in many cases so unclear and diverse that the local professionals and managers have difficulties to understand what is legal and what is against the law. Therefore also actors' attitudes towards legislation varies: it can be seen as an enabler or as a barrier from their point of view of. These controversial aspects are presented in the following citations:

*'We have knowledge and leadership gap; information management have a dominance. Responsibility of the grass root professionals should be increased - now professionals require too precise instructions. Strict regulation does not solve things and we need more enabling regulation'* (Ministerial Adviser B, Ministry of Health and Social Care)

*'There is no problem with information flow between professionals. I believe that the problem is the lack of expertise and management. In addition, the power of ICT system is difficult to overcome. Data protection does not prevent cooperation but city managers can easily blame it. And if the managers don't know the situation they cannot help the professionals which is their job.'* (Data Protection Ombudsman)

*'The legislation in social care is not coherent... ..we have noticed it when we have started to develop digitalized services.'* (Ministerial Adviser B, Ministry of Health and Social Care)

One specific aspect as regards the regulation is data confidentiality. Currently, the use of customers' data is very strictly regulated and therefore professionals do not have a possibility to exchange any information without customers' permission. According to the regulation, all the used data needs to be linked to the specific customer case at hand. However, from the point of view of professionals, it may be difficult to know what information is relevant and what is not, and it make professionals uncertain what information they actually need. Uncertainty may lead to the situation in which professionals avoid cooperation because they are afraid of doing mistakes. The problematic nature of the regulation has caused debate in this particular experiment and has been highlighted especially in the local level interviews. Even though professionals understand the need to protect citizens' privacy, they underline that the current regulation hinders information transfer between professionals and thus it

hampers the development of new integrative practices. Even though, data confidentiality is sensitive and challenging issue, our interviewees underlined that the changes in data confidentiality are possible if they are made from the viewpoint of citizens. In the other words, the focus should be shifted from the service provider to citizens and to their better and more holistic services. In practice it means, that in any case customers' service needs should be seen as central point in any discussion between professionals. The following quotes illustrates

*'The lack of knowledge about the data confidentiality leads to uncertainty. However, this uncertainty is not necessary. We should better describe customers rights as regards the data confidentiality: data should not be transparent and open to every professional, instead the use of data should be linked to a specific case. The regulation related to the data confidentiality aims to protect customers from outsiders. However, it is not always easy to define, who is an outsider when professionals aim to help customer? The concept of outsider is created because of organizational organization silos. However, keep that in mind, the data confidentiality can in fact break down these silos.'* (Data Protection Ombudsman)

*'Cooperation and information exchange among professionals is always possible if it relates to the specific customer need... All the information provided should always be attached to a specific case. Irrelevant information, even if it regards the specific customer, should not be passed to another professional. That is defined by law.'* (Lawyer from the Office of data Protection Ombudsman)

Like described in this section, current understanding of the experiments fundamental idea and related regulation causes uncertainties both within local professionals and ministry advisors. All the interviewees agreed that to improve the culture of experimentation more general guidance and commonly set targets are needed.

## 5. Concluding remarks

Experimental approaches have been suggested as a successful innovation model in the public sector. By integrating innovation and learning, it aims to answer to the challenges of current innovation activities characterised by slowness and ineffectiveness. It has been argued that experimentation corresponds to the conditions of modern society whose characteristics are continuous and rapid changes. In accordance with the theories on innovation management, experiments have often been linked to open innovation (Sørensen et al., 2010). According to it, adaptive trial and error, i.e. quickly realised small successes and failures, are a more realistic way to tackle the uncertainties of future developments than strong pre-planning and systematic steps from ideas to pilots and to the launch (Read et al., 2009).

Even though, the experimental development has gained foothold in the public sector, there are many challenges in adoption of these practices. This paper examined the manifestation of the challenges in the empirical context of a child and family services carried out in a middle-sized Finnish city. The specific local experiment concerned the introduction of a new integrated model of wellbeing, whose purpose was to promote multi-professional services and citizen empowerment. In the core of the new model was 'a common service plan' to which the user and the service providers committed themselves, and a digital platform which functioned as their mutual information channel.

The success of experiments crucially depends on the way in which they are carried out. In our case, a weak point was the lack of a bottom-up perspective. The initiation of the experiment actually followed a top-down practice that traditionally has domi-

nated the activities of public administration (Hartley, 2005). The interviewed managers were very eager about the renewal but they had not acquired sufficient commitment from the grassroots level and had not organized a balanced process between broad participation and small-scale pilots. Lack of the professionals' commitment also hindered the citizen recruitment and a new service development according to users' needs (Sundbo and Toivonen, 2011). Due to the strategic orientation in the project and the lack of professionals and users participation, the experiment failed. However, to enable the valuable results and successful experiment both top-down and bottom-up approaches should have been integrated in accordance with 'service encounter-based innovation' (Sørensen et al., 2013). Systematic interaction structure which combines the top-down ideas of balanced empowerment (Sundbo, 1996) and strategic reflexivity (Sundbo and Fuglsang, 2002) would have helped employees and users in disseminating and institutionalizing local innovations as an 'officially recognized' way of working.

Another problem in the experimental development was that practitioners did not understand the fundamental nature of an experimental approach. Practitioners who carried out the experiment were not familiar with the development, which integrates innovation to continuous adaptation and learning. Poor understanding was manifested as an unplanned project. However, to accept the trial and error in the development is not similar to unplanned process. Instead, experimental development is iterative processes in which an adaptive trial and error (Sarasvathy and Kotha, 2001) are in essential role. To enable it, enough structure to support good planning of utilization of resources and to foster collaborative creativity are required. This can be achieved via framing the problem in hand comprehensively (Read et al., 2009) and via providing the systematic methods to support continuous evaluation based learning throughout the development process.

An important challenge emerged also from the interlinkages between the goals of the national government and the strivings of local authorities. The experiments usually materialize at the local level, but are dependent on the national policies, politics and regulations. The aims of the governmental and local levels may differ or the dialogue between these levels may be insufficient regarding the aims. Our empirical study confirmed these challenges between national and local levels. One of the problems was the lack of interaction and common understanding of the nature and goals of the experimentation. Further, the discontinuity in policy level targets and unclear regulation caused challenges in actual development work. To accelerate the experiment friendly culture and to ensure the experiment based learning and dissemination, it is required to better understand the interlinkages between the goals of the national government and the strivings of local authorities. Further, current regulation needs to be better defined to enable the development of the experimental culture in the local level.

The poor interaction between local and national parties also hinders the dissemination of the experiments' results. In this specific case, it has prevented learning from the failed experiment, which would have been valuable for the ongoing reform of social and health care centres. At the national level, experiments are often launched without an allocation of the responsibility for the spread the results. Local actors, instead, have not resources for broader collaboration and they do not see dissemination as their task (cf. Moolaert et al., 2005). General models that would facilitate learning are rare. However, without systematic structures of learning and evaluation the developed innovations are not diffused in wider scale in a service system: im-

pacts which affect the entire service system are missing. Besides, the valuable learnings from potential unsuccessful cases are not achieved. To support systematic learning in and between experimental projects, and to accelerate the dissemination of the good experimented practices, common mechanisms and structures are required.

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# COMPARING PERFORMANCE MEASUREMENT FOR FACILITY MANAGEMENT AND INDUSTRIAL MAINTENANCE

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*The purpose here is to identify and explain similarities and differences in performance measurement for facility management and industrial maintenance. Based on the concept of measurement cost and recent survey articles, the organizational contexts, including service triads, servitization, as well as outcome-based contracts, are analysed. Differences are attributed to customer orientation and differentiation, precision of initial status documentation and relative importance of subjective evaluations of performance. Different terminologies taken from marketing research and operations management research may exaggerate the differences between facility management and industrial maintenance.*

## 1. Introduction

One category of business services concerns operations on heavy tangible assets belonging to a client. There are services linked to mobile assets, such as handled in logistics, and there are other services such as facility management (FM) and industrial maintenance (IM), both related to the client's immobile assets. Strong reasons for a growing interest in developing schemes for performance measurement of these and similar services are the widespread practices of outsourcing, servitization and the support provided by more efficient ICT systems.

The recent ISO 41011 standard defines facility management as an "organizational function which integrates people, place and process within the built environment with the purpose of improving the quality of life of people and the productivity of the core business". Examples of what this means in practice can be taken from the NACE Rev. 2 description of Class 81.10 Combined facilities support activities: "general interior cleaning, maintenance, trash disposal, guard and security, mail routing, reception, laundry and related services to support operations within facilities". Industrial maintenance is classified under NACE 33.1 Repair of fabricated metal products, machinery and equipment. Both facility management and industrial maintenance thus include technical maintenance, and both can be understood as aiming to raise the productivity of a core business.

With a focus on manufacturing related services, Lay et al. (2009) have developed a typology for business-to-business services in their analysis of new business concepts. They identify a set of characteristic features: ownership (during/after phase of use), personnel (manufacturing/maintenance), location of operation, single/multiple customer operation, payment model. While there are many combinations of these



features in the case of industrial maintenance, facility management provided as a service over the market shows less variation in its pattern. For FM, ownership of the facilities is not transferred to the service provider; however, it is conceivable that facilities owners may retain ownership of equipment that is at least partly used by the FM firm. As to personnel, this is clearly dominated by staff employed by the FM contractor and its subcontractors – but some customer staff coproduction does occur. Obviously, the location of FM operations is at the customer's establishment, although to take just one example, rugs may be removed for cleaning, and IT services as well as surveillance can be provided partly by remote staff. FM operation for multiple customers can be exemplified by commercial buildings with several office tenants who receive coordinated services.

Applying the cluster-based service typology recently developed by Jaakkola et al. (2017), FM appears in their examples to belong primarily to their first cluster (routine-intensive services), while IM presents features of both routine-intensive and technology-intensive services. In addition, it can be claimed that at least part of FM services (e.g. reception) belongs to their third cluster, that of contact-intensive services. Arguably, there are also elements in both FM and IM that could be counted as knowledge-intensive, although not to the extent typical of the fourth cluster in the typology.

There should be lessons that FM can learn from IM and *vice versa*. By recognizing and analysing specific features of FM and IM, rather than attempting to generalize observations under a common umbrella of “business services”, opportunities for learning should be possible to identify. Therefore, the purpose of this paper is to identify and explain similarities and differences in performance measurement for facility management and industrial maintenance.

The paper begins with an outline of how the comparison is based primarily on measurement cost reasoning. Next, the use of recent review articles and other secondary sources that emphasize the organizational context of performance measurement is presented. Three main phenomena are brought up: service triads, servitization and outcome-based contracts. Finally, the differences between performance measurement in FM and IT are attributed to precision of initial status documentation, range of stakeholders and the role of subjective evaluations of performance.

## 2. Theory: the importance of measurement

Taking two types of business services and comparing the practices used for measuring performance requires a theoretical framework that explicitly includes measurement activities. This should be particularly useful if the comparison involves the role of performance measurement in contractual relationships such as arise from outsourcing of services.

As many as nine theoretical perspectives adhered to by earlier investigators were identified by Wynstra et al. (2015) in their research agenda for service triads. Among these nine perspectives, transaction cost economics recognizes the *ex post* costs arising from monitoring contractual performance. Servitization as when manufacturers enter the after-sales services market can be understood as vertical integration. Thus it is important when Barzel (1982) asserts that high measurement costs encourage vertical integration. Empirical investigations of the effects measurement

costs are few, however, and mostly oriented towards IT services. In their study of IT service contracts, Argyres et al. (2007) found that “projects for which measurement is difficult also pose difficulties for developing detailed task descriptions”. Lacity et al. (2011) have expressed doubts regarding the applicability of transaction cost economics, pointing to ambiguous results from earlier empirical studies that include difficulty of measurement. Whether these doubts are valid also for other business services such as FM and IM – as well as for extended versions of transaction cost economics that allow the evolution of both provider and buyer capabilities (Langlois, 1992), remains an open question.

There is no lack of studies of how to devise performance indicators, in contrast to how little interest has been generated by the existence of administrative costs of actual measurement and what the consequences of these costs might be for outsourcing and servitization. The relative ease of measurement has increased by the current availability of efficient ICT solutions, but there is still an effort involved. This is clearly so for most organizational indicators as opposed to technical indicators, since there will be more of evaluation than simple measurement (Djellal; Gallouj, 2009, 51). The increase in subjectivity when assessing people-oriented performance leads to challenges in monitoring outsourced services.

### **3. Methodology**

This is a conceptual paper and depends on earlier research on monitoring of business services. Recently, several useful surveys of studies of industrial maintenance have been published by researchers in operations management, supply chain management and marketing.

The literature on performance measurement in facility management is less extensive, with the exception of studies of effects on customer productivity (a theme that is seldom approached by those who investigate industrial maintenance) and of buildings-and-energy studies.

When depending on earlier published research as here, it is a risk of being misled if authors studying performance measurement in FM tend to work within theoretical frameworks different from those typical of published IM research. Differences in terminology may then overshadow essentially similar features of performance measurement in FM and IM.

### **4. Organizational context of performance measurement**

While the straightforward measurement of technical performance might be largely similar in the cases of industrial maintenance and building maintenance, the organizational context may show typical differences, considering performance measurement both within organizations and where several organizations are involved.

## 4.1. Industrial maintenance

The European standard EN 15341:2007 “Maintenance key performance indicators” synthesizes principles found in the mainstream literature on equipment maintenance. It lists economical, technical and organizational indicators, but the organizational indicators are clearly of an internal nature.

The scope of maintenance has shifted from a “narrowly defined operational perspective” to an “organizational strategic” perspective, according to the literature review by Simões et al. (2011) of maintenance performance measurement. They collected 345 measures from the literature and identified 37 measures with more than two occurrences in the material. In the group of the least used measures, they listed “customer satisfaction”. The three frequently identified industry contexts were automotive, electrical/electronic and chemical.

Kumar et al. (2013) in their state-of-the-art review refer to the increased reliance on outsourcing as a reason for performance measurement. They also bring in a wider view of an organization’s stakeholders. Stakeholder satisfaction is classified by them as a soft indicator among leading indicators that may be used for predicting financial performance. Nevertheless, the strong human component of such indicators is seen as creating problems due to their lack of hard objectivity and reliability. Multi-criteria indicators reported in earlier literature covered by this review do include customer and employee satisfaction. The traditional mainstream literature is here seen as dominated by indicators relating to equipment performance, as well as by maintenance-cost-related measures. It is obvious that inspiration from the Balanced ScoreCard has been instrumental for the development of a broader set of indicators of maintenance performance, including the customer perspective. Tsang et al. (1999) were thus inspired by scorecard principles when they brought in customer satisfaction and a few other measures in this perspective.

Again, there is also little evidence of “full reflection of organizational context” in the review of performance measurement and management two years later (Parida et al., 2015), published by almost the same group of authors as in 2013. Indirectly, they here refer to measurement costs when acknowledging that organizations may suffer from data overload. The need for satisfying “all stakeholders” is underlined, and their review includes a number of studies published since the 1990s that include customer perspectives, customer satisfaction and customer focus.

Although it is not clear how far industry practices in general have moved along the trend of including organizational performance indicators with a wider set of stakeholders in industrial maintenance, there is a consensus among researchers that the trend has existed for decades.

## 4.2. Facility management

Performance measurement models often used by FM professionals in the UK and Ireland include key performance indicators (KPIs), the Balanced ScoreCard (cf. Amaratunga et al., 2002; Amaratunga; Baldry, 2003) and the EFQM (European Foundation for Quality Management) business excellence model (Meng; Minogue, 2011). “Client satisfaction” was found by Meng and Minogue to be the most important KPI, followed by “cost effectiveness”. When Hinks and MacNay (1999) had engaged FM

practitioners in a broad Delphi exercise in order to identify FM KPIs, almost all the indicators were output-oriented, reflecting a client perspective.

Since the 1990s, the important fields of FM KPIs appear to have shifted (Lavy et al., 2010). At first, the trend "was moving toward the management of maintenance activities". Later trends suggested concentrating on sustainable energy and economic savings. Nevertheless, there remains a fundamental concern with the customer perspective. The analytical hierarchy process (AHP) has been applied to FM KPIs in a case study of a teaching hotel (Lai; Choi, 2015). In this specific context, education support was ranked highest, and next in rank came facilities performance indicators, comprising maintenance standard, safety & security, service standard and guest satisfaction.

There are a few studies concentrating on performance measurement for building maintenance as one aspect of facility management, the one which is more closely related to industrial maintenance. Here, customer satisfaction has been measured relying on the SERVQUAL scale. Siu et al. (2001) found in their case study that for both clients and service providers, the reliability dimension was the most important; unlike the providers, clients "considered tangibles less important than the other three dimensions of responsiveness, assurance and empathy". These results were not confirmed by Lai and Pang (2010) in their Hong Kong study of satisfaction with building maintenance; instead they found almost equal expectation gaps across all five SERVQUAL dimensions.

### 4.3. Service triads

It is not unusual that early studies of business services assumed a setting consisting of a dyad of buyer and provider. For many business services, there is a growing interest in applying the concept of service triads, made up by buyers, subcontractors and end customers (van der Walk; van Iwaarden, 2011) or buyers, suppliers and customers, as in the overview provided by Wynstra et al. (2015).

Considering industrial maintenance, Karatzas et al. (2016) have investigated relationship determinants of performance in service triads. They analysed maintenance, repair and overhaul (MRO) contracts and in particular the performance of the manufacturer-service supplier toward the manufacturer's customers, exploiting data from no less than 38 triads within the network of a large commercial vehicle manufacturer. Their survey included a composite service performance measure, designed as an average of KPIs with four aspects: car safety test first-time pass rate, breakdown attendance times, spare parts availability, and "a specific measure capturing each site's responsiveness to incidents concerning vehicles under fixed-cost service contracts".

Although the "service triad" term is rare in the FM literature, the phenomenon of complex supply chains and customers' customers is often taken for granted in the facilities context. Thus it is common to analyse the relation between users and owners of buildings as well as service providers (Kadefors; Bröchner, 2004), who often coordinate a number of service subcontractors (Jensen, 2017). Public sector organizations are important users of FM services, internally managed or procured externally, and very often, e.g. for hospitals (Featherstone; Baldry, 2000), have complex patterns of stakeholders that cannot be aggregated in practice as a single and coherent customer.

Unlike the field of industrial maintenance studies, there has been considerable research on the effects of FM on end customer performance, typically by studying self-reported effects on office worker productivity (de Been et al., 2016). This contrasts with the limited interest in measuring the service productivity of FM providers themselves (Bröchner, 2017).

Van der Walk and Wynstra (2014) have studied buyer-seller interaction when NS purchase cleaning services, for stations and for their own offices. They rely on business services classified into component services, instrumental and consumption services. Station cleaning and train cleaning fall within component services, while office cleaning is seen as a consumption service. This study underlines the need for mapping the complexity of seemingly mundane services and identifying differences in interaction patterns.

## 5. Servitization

When manufacturers offer maintenance, repair and overhaul (MRO) services in a bundle with their physical products, it is an important example of servitization, a phenomenon that has attracted considerable interest, as shown by the review articles by Kowalkowski et al. (2015) and Baines et al. (2017). Studies of the dynamic processes of servitization dominate these reviews, and only exceptionally have researchers compared bundled and unbundled MRO services from a transaction cost viewpoint – or introduced cost reasoning at all (but see e.g. Spring and Araujo, 2017). The market expansion of bundles with MRO could be partly explained by measurement cost issues and information asymmetry, insofar as servitization is often supported by an advanced analysis of equipment data, where the original manufacturer possesses historical data including data from the particular context where the equipment is used. Unique access to earlier data allows more efficient interpretation of the current flow of measurement data from a given piece of equipment.

Long before the term “servitization” was coined, Otis as a leading manufacturer of lifts launched Otisline, which offered remote diagnostics and control for their installed lifts (Ives; Vitale, 1988; Dörner et al., 2011). Lifts are building related products, where malfunctioning is easy to observe and at the same time may pose a serious hazard. Otis and later Kone provide services that belong to both industrial maintenance and facilities management.

In his performance manifesto, outlining the trend away from just relying on financial indicators and noting inspiration from the quality movement, Eccles (1991) emphasized that “advances in information technology such as powerful workstations, open architectures, and relational databases vastly increase the options for how information can flow.” Not only the increased number of options for information flow, but the general reduction of measurement cost due to ICT developments has organizational consequences.

Today, both IM and FM are supported by the collection of large volumes of measurement data. In the case of facilities, it is energy management that includes generating sensor data used for the automation of indoor climate control (Zhou et al., 2016). Maglio and Lim (2016) in their analysis of big data and smart service systems introduce a fundamental distinction between data from objects and data from people. En-

ergy use in office buildings is heavily influenced by the behaviour of office employees. As recently pointed out by an article in *The Economist* (April 29<sup>th</sup>, 2017), collecting data from office employees, directly or indirectly, raises issues of personal integrity, which should not be a challenge in the context of industrial maintenance.

If construction contractors offer packages of FM along with their buildings (Bröchner, 2008), it is seldom labelled as servitization, although road contracts with multiyear operations and maintenance included, as well as infrastructure concessions, are to be understood as analogous phenomena. Construction contractors are project-based firms, and servitization has to be interpreted differently in this context, as illustrated by the case of construction firms developing services for energy-efficient buildings (Galera-Zarco et al., 2014). The development of information and communication technologies, in particular the Internet-of-Things based on sensors in buildings, creates new business opportunities for major construction contractors (Robinson et al., 2016).

Another impetus for long term servitizing of construction projects has come from government policies intended to ease the burden of public debt. From the 1990s and led by the UK, the wave of private finance projects (Winch and Schmidt, 2016) led to a quasi-integration of construction and facility management in concession consortia, although it is uncertain how far this was driven by financial considerations and particular government policies rather than economies of service performance control.

Just like it has been observed that manufacturers who have entered a path of servitization may later abandon at least part of their service offerings (Kowalkowski et al., 2017), we find major non-service firms withdrawing from facility management; the CBRE Group acquired Global Workplace Solutions from Johnson Controls, historically a manufacturer, in 2015. Skanska, a major project development and construction group, spun off Coor Service Management already in 2004. From a performance measurement viewpoint, it is an open question how ICT developments will strengthen or weaken the forces of integration.

## 6. Outcome-based contracts

Many researchers have contributed in recent years to the study of outcome-based (or performance-based) contracts, often associated with industrial maintenance and servitization. Contracts based on measuring outcomes or performance are viable only if measurement is possible with little effort and ambiguity. Selviaridis and Wynstra (2015) have reviewed the literature on performance-based contracting from an operations and supply management perspective. They provide a simple model with a triangle of performance, risk and incentives. Considering that facilities management has a stronger link to supporting people in their work, rather than just upholding a technical function of equipment, it is noteworthy that the review identified numerous publications concerning the health care sector. Nevertheless, the FM literature appears not to use the expression “outcome-based contracts”. As with “service triads”, the question is then whether this is merely a terminological difference or that outcome-based FM contracts are unusual or non-existent.

It is unlikely that the difference between industrial maintenance and facility management in this respect arises just from a generic difference in customer involvement. Ng

et al. (2009) took their examples from outcome-based MRO contracts in the defence industry, emphasizing the effects of customer behaviours and involvement. In particular, they emphasized the need for understanding how customers actually use equipment, which can be translated into cost savings for both parties. The need for skills among those who deliver the services emerged as a crucial issue of human resources. Furthermore, they noted that there must be capacity to deal with situations where inspection and repair are difficult to carry out; also, that the provider depends on thorough knowledge of the customer's capabilities when there is an element of coproduction to achieve contractual outcomes.

These observations can be interpreted in a risk management perspective. Hou and Neely (2017) now identify five dimensions of risk associated with outcome-based contracts such as are found in bundles with industrial maintenance. These dimensions are complexity, dynamism, capability, alignment and dependency. If one or more of these types of risk is excessive, outcome-based contracting is infeasible. It can be argued that "complexity" accounts for the scarcity of outcome-based FM contracts. Incomplete descriptions of initial status of assets are more frequently met with in FM. This deficiency can be thought of as a consequence of high costs for analysing and recording a vast set of data describing details of existing facilities. Nevertheless, for newly constructed facilities with a digital documentation inherited from the design and construction stages, there is much less uncertainty than when an external FM service provider is brought in to manage an older building that in all probability includes previously undocumented technical changes to the structure.

The risks faced by service providers of condition-based industrial maintenance do include a limited knowledge of the initial status of assets. This is what has been highlighted by Holmström et al. (2010) who discuss visibility-based industrial services, by which they intend how external service providers are given access to information on the "installed base".

Many earlier authors seem to take it for granted that outcome-based contracts are a superior solution to customers' problems. Given the higher level of uncertainty that characterizes most FM contracts, there might be a point in having detailed input specifications, since they might lead to constructive communication between client and provider during the contractual period (Kadefors, 2008). It is therefore crucial to consider which style of specification is more efficient in developing the capabilities of both providers and their clients.

Although there have been many studies of the effect of facility management on the perceived productivity of office workers, as mentioned in Section 4.3, it is difficult to measure these effects objectively and directly, unlike productivity effects of industrial maintenance services. This could also contribute to explaining why there is little of performance contracting for facility management. One exception is what specialized energy service companies (ESCOs) offer: Energy Performance Contracting (EPC) projects, where the ESCO combines finance, installation of equipment, monitoring, staff training for system operation and control. Typically, the ESCO guarantees a level of energy savings. Clearly, and in addition to the relational risks inherent in responsibilities divided between co-producing clients and ESCOs, there are technical risks associated with measurement in EPC: "modeling errors, poor data quality for M&V works, as well as measuring imprecision" (Lee et al., 2015).

## 7. Discussion and conclusions

Over the years, research on performance measurement in industrial maintenance has moved from a single focus on technology to become more aware of organizational contexts, although these have often been restricted to the environment within an organization; there are also instances of multiple stakeholders being mentioned. Still, there is a strong contrast with studies of how performance is measured in facility management, which consistently appears as more customer orientated and sometimes with recognition of various categories of users of one and the same facility. This complexity of customers is probably at least one of the reasons why “service triads” is not part of the FM researcher vocabulary. It might be doubted whether everyday practice of FM performance measurement includes KPIs related to the productivity effects on customer core activities, but there is no lack of studies following this line of thought.

Not only “service triads” but also a major theme such as “servitization” in the field of industrial maintenance studies is a rarity in publications related to FM performance measurement. Why “servitization” is seldom referred to by FM researchers may reflect that FM service providers have emerged from a variety of industrial origins. A few have originated in manufacturing, typically from energy-related technologies, while the majority of FM firms have grown from a starting point in catering, cleaning, and other business services, in addition to those who entered FM from the construction industry. Unlike IM, the “installed base”, here interpreted as erected buildings, seldom creates a profitable link to after-sales business. It seems difficult to bridge the gap between the project culture typical of construction firms and a culture supportive of the long term contractual relations of FM services.

While performance measurement in IM is dominated by technology and possibly costs, the technical status of the system to be maintained appears to be easier to describe precisely than in the case of most facilities. This difference exists also for building maintenance, which is one constituent of FM that is understandably close to IM. Additionally, there may be less uncertainty in objectively measuring the results of IM than in the FM context. Both these sources of uncertainty in FM contracts are probable reasons why an “outcome-based contract”, at least as a term, is seldom realized in FM.

Finally, it should be noted that the differences found in the two literatures of FM and IM can appear greater than the underlying realities. Since FM performance researchers tend to study, or at least be influenced by, how services influence people, many of them apply theories and concepts from marketing research. For those who study performance measurement in IM, the theory background is often in operations management or supply chain management, with implications for the terminology employed. It is thus an important challenge to bridge these theoretical worlds in order to transfer ideas and experiences between FM and IM. There is a potential for IM researchers to learn from FM in order to develop the understanding of productivity effects on customers and customers’ customers; furthermore, the study of fully servitized firms rather than of the process of servitization could be inspired by FM studies. In the opposite direction, lessons from IM, prior studies of performance measurement for outcome-based contracts appear to hold valuable insights for FM.



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# CONCENTRATION OF INCOME IN THE SERVICE SHARING ECONOMY. PLATFORM CASES IN MEXICO

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## **Abstract**

The objective of this paper is to propose an economic approach to analyse the concentration of income through platform firms, the marketplace linking users (customer/client) and providers within production through app developers and devices owners.

It is important to identify the actors that put the assets into play by looking mainly at 1) at transaction costs, 2) the externalities (network effects), and 3) the effects on the concentration-distribution of incomes.

A selection of 19-service platform firms in Mexico in transportation and crowdfunding are analysed considering their fees, market share and income. The study revealed that these variables allow them to earn large profits when an oligopoly is developed. Then the question of counterbalances through competition arises, but the main concern is about the need (or not) for regulation during this phase of SES production.

Index Terms: Platform firms, Concentration of income, Uberization, Service Economy, Sharing Economy, Crowdfunding, Mexico.

## **1. Literature Review**

Platform firms providing online services enable people to share underused assets such as cars, accommodation, bicycles, household appliances and other items with others willing to pay to use them. The result is known as “collaborative consumption”, the “collaborative economy”, and “peer economy”, “access economy or sharing economy (Economist, 2013).

This new way of producing services through the platform represents a fundamental shift in organizational market structures made possible by advances in information and communications technology (ICT).

Sharing economy systems work by exploiting slack hidden capacity in privately owned assets, changing the way of management in three main aspects 1) orchestration of assets and resources, 2) external interaction and 3) focusing on the ecosystem value (Table 1).

**Table 1 Technology Management in Platform Firms.**

	<b>From</b>	<b>To</b>
1	<b>resource control</b> (equipment, real estate and intangible assets like intellectual property)	<b>orchestration of assets and resources</b> coming from the community (rooms, cars, ideas and information), that is the network of producers and consumers is the main asset.
2	<b>internal</b> production : traditional firms organize their labor and resources to create value from materials sourcing to sales and service.	<b>external</b> interaction platform firms create value by facilitating interactions between external producers and consumers.
3	a focus on <b>customer value</b> on individual customers of products and services-	a focus on <b>ecosystem value</b> . the PF dealing with the total value of an expanding ecosystem in a circular, iterative, feedback-driven process.

Based on (Van Alstyne, Parker, & Choudary, 2016)-

A controversial aspect of the literature is about the conditions for constructing the "uberization" model. One view is that uberization could occur everywhere and another that the conditions are difficult to reproduce. These are high and regulated prices; monopolistic markets; huge numbers of daily users; and lack of viable alternatives (Table 2).

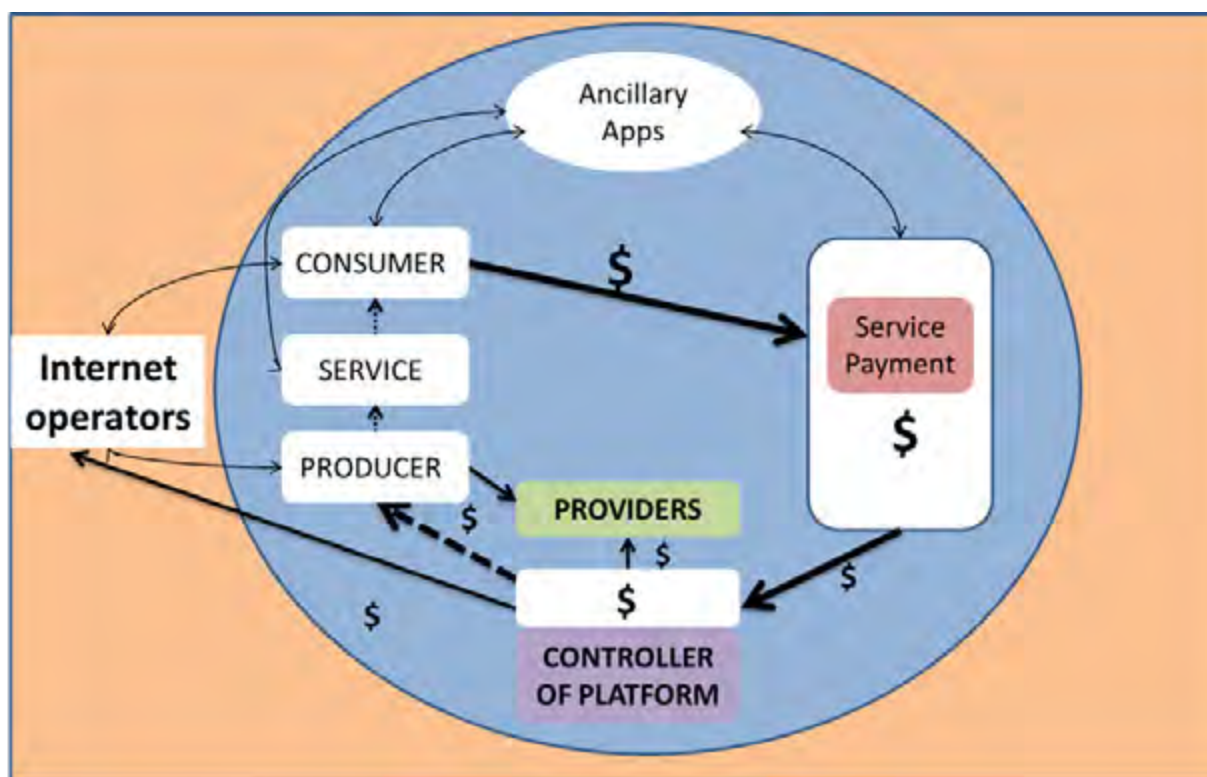
**Table 2. Uberization everywhere or in few service sectors.**

<b>Everywhere</b>	<b>Few sectors</b>
<ol style="list-style-type: none"> <li>1. <b>Housing</b>, renting or purchasing a property.</li> <li>2. Automotive <b>Re-Selling</b>, buying a used</li> <li>3. Mobile Wireless, could come into a P2P service.</li> <li>4. <b>Financial Services</b>, can use a P2P marketplace.</li> <li>5. <b>Personalized Tasks</b>, some people have a second income performing freelancing services.</li> </ol> <p>“SMBs” can hire with great flexibility and "on demand" through digital marketplaces. Services like “Contently” for writing, “Rev” for transcription, and “SuperTasker” for editing are examples of such P2P marketplaces.</p>	<p>high and regulated prices; monopolistic markets; huge numbers of daily users; lack of viable alternatives.</p>
Source: (Thrasyvoulou, 2015)	Source: (Tullman, 2016).

## 2. Methodology.

An analysis of the capital flow in the Service Platform Firms shows that the following components and agents are put into play:

- 1) The internet operators,
- 2) The Platform infrastructure which controls the service,
- 3) The providers of the service through the App,
- 4) The producers and consumers who enter into a relationship organized by the Platform,
- 5) The production inputs,
- and 6) Other ancillary Apps (GPS, Electronic payment, etc.). (Fig 1.)



Source: Author elaboration based on (Van Alstyne, Parker, & Choudary, 2016)

**Fig 1 Service Platform Firms. Ecosystems of Value and Resources Flows.**

It is argued (hypothesis) that the consolidated platform firms evolve from 1) from an initial phase with a relative satisfactory distribution of benefits between participants, 2) to a second phase achieving a critical mass, and 3) due to the network effect become an oligopoly.

The network effect is “the driving force behind the internet economy”. It corresponds to the demand-side economies of scale. Therefore, those firms that attract more platform participants – clients as asset owners and operators can offer better service quality, thus having an offer-side economies of scale and scope, and this attracts more participants, so generating a virtuous circle which ends in monopolies. (Van Alstyne, Parker, & Choudary, 2016) p57.

However this is not always the case as in the initial phase, entrepreneurs have to deal with “the tension between giving away information—to let people know what they have to offer—and charging for it to recover their costs” (Shapiro & Varian, Information Rules, 1999). Though as the firm reached a flow of consumers (the demand of the clients), it begins a second phase of net income for the PF. At the end, a third oligopoly phase could occur if the PF reached more than 50% of the market, so it has the power to charge not only marginal costs but large fixed fees, which allows it to accelerate the accumulation of income.

To look at this evolution, 19 PF in Mexico providing Taxi and financing industry services are identified according to their stage of development, the market share and their participation in total income (Tables 3 and 4) .

The Gini coefficient is used In order to estimate first, the market distribution and second, the income concentration within platform firms. The template provides you with various style elements to present your thoughts in a structured way, such as headings, lists, etc. (cf. Table 1: List of pre-defined styles). A normal paragraph of text always has the style "Paragraph".

### 3. Results.

The responses to interviews carried out with 19 Platform Firms, PF, 5 in personnel transportation and the others, 14, in the crowdfunding industry. For transportation the main agents are the cabs and the taxi clients that are interconnected by the Platform Firm. In the case of crowdfunding there are people, projects or firms which are needing financing resources and on the other hand investors.

The attributes used to test the PF are: 1) Kind of Business model, 2) The assets, 3) Transaction costs 4) Service Quality 5) The internal regulation, 6) The Market context, Labor porosity, and 7) the distribution of income and external regulation.

#### BUSINESS MODEL

In the Transportation industries there are 5 PF on the same Business model charging different fees (Table 4).

While in the crowdfunding industry there are also different business models: Financing on charging interests, Equity, Reward and Donation. Most of the PF support entrepreneurship (PF 2,4, 6, 10, 11, 12, 13 14). There are general Platform firms (PF 1, 7); oriented to real estate projects (PF 5,8); one financing based on factoring (PF 9); and one teaching crowdfunding (PF 3) (Tables 5).

Therefore the model allows for a large distribution of benefits which are discovered and put it into play through a web application, with the objective to be used in a large scale. The capital is obtained from "idle social capacity", as it is based on non-used assets, or by investing in buying a car on credit. This means that the assets are put in as capital by the owners (car-Ubers, funds). The social impact is important for SME as it is opening a new way for funding projects (initial phase, see hypothesis). So fund raising for non-profit projects is now growing as an alternative to start-ups and entrepreneurs around the world who found it difficult to raise venture capital from financial institutions. ( BID Fondo Multilateral de Inversiones, 2013).

The TCs are decreasing with the use of the platform for the producer and for the client. But when the demand for services is going up, the platform uses dynamic prices which are charged to the client, thus shifting the extra money to the producer and the platform. As the drivers have no information of the trip prior to the service, they have no opportunity to look for other more profitable trips.

#### **Table 3. Transportation and Crowdfunding: Attributes of the Platform Firms**



	Transportation: Platform Firms			Crowdfunding: Platform Firms		
	Producers	Clients	PF= Taxi	Investors	Clients	PF
• Business model		demand for transportation by individuals	Platform + complementors		Projects, firms, social groups,	<b>Platform + complementors</b>
• Assets	The owners of the cars put the capital assets			Many investors put the capital	Management of capital and resources to developed a product	<b>Crowdfunding:</b> charging a commission; or with 2 banking sides paying interest x to investors and charging interest Y to lending to clients.
• Transaction cost, TC	driver have no information of the trip prior to the service : The risk for capital is distributed amongst many investors	better in time		The risk of capital is distributed into many capitals	Less cost of raising capital	<b>Equity: Reward: Donation</b>
switching costs and lock-in	low	low		low	low	
• Quality	better cars	Better, Cheaper		small investments per investor.	alternative niche funding	
• Internal Regulation			<b>Governance is done mainly by PF: network externalities</b>			<b>Depending on the PF niche : network externalities</b>
CONTEXT						
Market:	Large Cities		<b>Critical Mass</b>	Alternative financing and diversity of nich funding		<b>variety of niches</b>
• Labor Porosity	Offer increased by			capital porosity: A lot of diversify investors	Niche funding demands	
• Distribution	Distribution of Incme change with phase.		Monopoly behavior	Distribution of Risk change with phase.		Competitive behavior
• External Regulation	Underpaid (depreciation), transferd to client and PF		Conterblance of Oligopoly	Crowdfunding is affected by the external regulation		Protectionism against alternative funding

Source: Author elaboration

- Transaction cost, TC

An advantage of crowdfunding is the low level of risk in capital outlay as it is distributed between many investors, thus making it less costly to raise capital.

“The suppliers of products and services via sharing platforms often do not have to comply with many laws as their traditional competitors have to. That enables individual suppliers to avoid potentially significant costs for compliance and to offer their supplies at lower prices.” (Vitković, August 3, 2016)

- Quality

The platform rules for the service producer allow for better quality of the physical conditions of the cars. The means of payment for the service, which is charged to a card, is easy and better for the client but not for the drivers as they only get their share of the income at the end of the week.

The service product is provided in a competitive way using specialized data and information from the customers and producers to increase quality and to lower prices.

For the crowdfunding PF, the quality is a function of the investment firms' selection of projects and the choice and involvement of the investors made by the platform algorithm as well as the stage evolution of the firm. The above scheme is applied to the analysis of selected 19 Platform Firms, PF cases pertaining to transportation (5) and crowdfunding (14). Of the transport companies 1 is an oligopoly, 2 are consolidated and 2 a new entrants. Meanwhile, half of the crowdfunding firms are in the initial phase which means a lower degree of maturity compared with the transporting firms operating in Mexico.

- Labor and capital porosity

In Mexico's large cities there are many economically active people without a full time job (porosity of labor time). Thus, there are people that can work in a PF with flexible timetables and they have the required skills (particularly for Uber): drivers with their own car or without one such as students, retired workers, part-time workers, or the unemployed.

Also, it is possible to find partial resources on a small scale (porosity of capital) that can be raised by the Crowdfunding Firms. This phenomenon has developed worldwide in recent years, responding primarily to 1) (Formal) Financial market instability due to the financial crisis since 2008. 2) Innovation related with the new use of internet; and 3) lack of specific regulation in these forms of economic activity. (Observatorio Economía Digital, 2014).

## REGULATION

- Internal/ Regulation

In transport, the PFs compete with the existing conventional taxi services which are quite highly regulated and require a taxi permit which are difficult to obtain and demand fulfilling a number of formalities. Thus, the PF have imposed a governance with rules for the registration of drivers and private cars that, with lower transaction costs, offer transportation services to registered customers. “Instead of adhering to a precise and rigorous code that spells out the rights of customers and the obligations of service providers ... platform operators rely on the widely distributed knowledge of participants in a service, hoping that the market will eventually punish those who misbehave” (Morozov, June 2015). The lower levels of regulation of Platform opera-

tion is favorable to achieving a “network effect”, that is higher sales, and consequently lowering the average cost of doing business, allowing them to increase quality which permits more price cuts—a virtuous feedback loop that produces oligopolies. This positive impact is in the third phase (see hypothesis) so after the PF reached a “critical mass”, the network effects of operating a service that becomes more valuable as more people join it. The PF is disrupting many economic activities with technology “to circumvent unnecessary bureaucracy and legislation” (Glance, 2015).

Dealing with crowd-funding, “Mexico will soon enact an updated securities regulatory regime to embrace internet finance” (Crowdfundinsider, 2016).

#### . External/Regulation

There is still no clear way to regulate the PF in order to orient the competition between the traditional incumbent firms with the PF. The external regulation comes “instead of adhering to a precise and rigorous code that spells out the rights of customers and the obligations of service providers ... platform operators rely on the widely distributed knowledge of participants in a service, hoping that the market will eventually punish those who misbehave” (Morozov, June 2015).

Two criteria are considered: 1) The stage of the evolution of the industry and the relative participation in the market of both the incumbent firms and the PF. 2) The nature of the industry market.

Those two aspects explain how much distribution of income and social benefits take place versus concentration of income due to the oligopoly behavior of profits which are mainly accumulated by the platform controller firm (based on the economic network effect).

The transportation firms show a Gini index concentration of 39% in relation to income. This is part of the concentration of the Market (27%) and the income per car (22%) (Fig 2).

The platform crowdfunding firms are complementary niche type charging different costs, from 1% up to 18% (Table 5). However, in the crowdfunding there is a 30% of concentration of income of the PF (Income multiply by the commission fees) (Fig3).

“It is overall argued that the sharing economy changes the way of doing business for good, providing an alternative to the traditional markets and a better utilisation of unused assets, what calls for an effective and carefully tailored regulatory framework.” (Vitković, August 3, 2016). However the regulation is depending on the nature of industry, as this paper show.

- **Discussion:** The sharing economy is conceptualized as exploiting slack capacity in privately owned assets. This masks hidden business outside the current regulatory framework, which becomes an additional source of revenue for the PFs based on the network effect. Therefore, there is a technology source, which become an additional gap between companies as drivers of income inequality (Bloom, 2017). In this context and in view of the growing participation of PFs in certain consumer industries it is pertinent to study the PFs as income concentrators mainly in the oligopoly phase.

## 4. Conclusions

The generation of Platform firms related to the sharing economy shows that there is a direct initiation related with increasing the use of hitherto unused assets. There is a second phase in which the PF can assure its survival based on reaching a critical mass for the services demanded.

From there on, what began as a sharing economy turns in a third phase into a real business as is the case of transportation Platform Firms. Then there is a positive network effect, as the number

of service producers (cars-drivers) is growing along with the demand from clients. Therefore, the PF (Uber) as the internal controller behaves as an oligopoly in the way it accumulates income. It shows a 39% Gini coefficient of concentration calculated for the PFs selected (Fig2). However, this is also a result of PFs' rules aimed at providing better quality services at a lower cost to clients compared with the traditional taxi services. Both these gaps mainly originate in the additional taxes and permissions costs that the traditional services have to assume.

The case of crowdfunding shows that it is continuing within the sharing economy, based on the funds from people and attending niches not well served by the incumbent funding firms.

The question of regulation is important both for the platform firms which reduce oligopoly behavior as well as for incumbent firms in order to get a better quality and less fees of their services.

**Table 4. Transportation Platform firms in Mexico, 2016**

Firm	Business model	Assests	Total Income	Fees and charges	Stage of the platform *	Number of registere d cars
Uber	Uber is a location-based app that provides hiring an on-demand private driver.	Assets are the private cars register in the platform. The risks are diminished trough some rules to be register either as a driver or as a pasanger	195580648	25% of the cost of the ride.	3	39000
Cabify	Private transport service operated on a platform	The capital is provided by private car drivers who takes charge of operating and depretiation costs.	64190571.8	20% of the cost ride	2	16000
Avant (Mexican Uber)	Private transport model, connects drivers and passengers.	The capital is provided by private car drivers who takes charge of operating and depretiation costs	511578.947	10% of the cost ride	1	900
Easy Taxi	Private transport model, connects drivers and passengers.	The capital is provided by private car drivers who assume operating and depreciation costs.	30283455.2	15% credit card ; 20% cash	2	10065
Yaxi	Private transport model, connects drivers and passengers.	The capital is povider by the private driver cars who takes charge of operating and depretiation costs	27229235.4	15% credit card ; 20% cash	1	12340
Total			317795490			78305

Source : Author's elaboration

Table 5a: Mexico Crowdfunding Platform Firms, 2016

Crowdfunding Firm	Firm	Business model	The Platform Intermediation (algorithm, system, technology)	Who contributes the capital and Takes The Risks	fees and charges % of Capital	Stage of the platform
1	Kubo Financiero	Crowdfunding and Peer to Peer (P2P) Lending.	The firm's platform connect people who need a loan with people looking for investment opportunities. The platform ordered the investments projects according to risk / profitability, so that the investor can make a diversify portfolio; and the entrepreneur to obtain financing.	investor. The risk is shared between the investor and the firm	6.50%	2
2	Fondeadora (Fusioned with Kickstarter)	Crowdfunding for community Social Entrepreneurs projects through Business Simulators, Mentors, Campaigns	Methodology that evaluates and organizes the creative projects according to their feasibility with a deadline and an investor rewards system.	Investor: Capital risk is low as the decision to invest is informed. The reward for the amount invested is known in advance.	2.45%	3
3	Mi Cochinito	Teaching crowdfunding, providing mentoring, sensitization. Campaigns to Social Entrepreneurs with their	Integration of social initiatives with interested entrepreneurs in the field, validation of the social impact of the project and promotion in social networks	Investor: Capital risk is low as the decision to invest is informed. The reward for the amount invested is known in advance.	8.50%	1
4	Play Business	Financing for entrepreneurs	Platform linking investors with entrepreneurs with a project, how much money he needs, the percentage he is willing to pay and the time it will take to develop it. The investors make the first payment (deposit).	Risk taken by the entrepreneur and the investor.	5%	3
5	Briq Fund	Briq is an intermediary in the financing of Real Estate projects.	By means of algorithms the platform calculates the yields. Investors can monitor the progress of each project of the portfolio which are selected and analyzed by an investment committee.	Investors and Real State Developers		1

Source : Author's elaboration.

Table 5b: Mexico Crowdfunding PF 2016.

Crowdfunding Firm	Firm	Business model	The Platform Intermediation (algorithm, system, technology)	Who contributes the capital and Takes The Risks	fees and charges % of Capital	Stage
6	PitchBull Funding	An auction is organized for funders, bringing together SMEs and Entrepreneurs who need financing for expansion projects.	It is a platform linking financial people (persons or financial firms) and credit applicants for expansion projects (SMEs and Entrepreneurs). A risk analysis is done. An auction is presented to the funders, those with the lowest rate is the one chosen by the system.	Investors and Real State Developers	1%	1
7	Prestadero, COMMUNITAS AURUM	Loans and credit through a platform	The platform analyzes the applications of the people who need credit, later this information is presented to the investors who decide whether to grant the credit or not. A loan can be financed by several investors. The allocation of interest rates to lenders depends on the level of default risk and the term for which it is requested.	Personal loans with rates from 8.90% per annum	The investor is charged 1% for each payment received	1
8	Expansive	Demand investments and loans to be offered to projects of Real Estate sector	It allows the collective funding of investors and real estate developers. The projects are registered on the platform. A financial, legal, technical and market evaluation is carried out. If the requirements are met the investors can find in the platform information about the developer and the characteristics of the project.	Investors and Real State Developers. Payment to investors is made once the sale of real estate development is completed.	18% yields	1
9	FINV	Factoring, the investors can select the purchase of invoices to SMEs issued by companies qualified as AA.	It is a platform that allows the purchase of SMEs invoices from AAA companies. The platform registers SMEs and raises the invoices that need to be financed. Investors decide which bills to fund. Risk analysis is performed using algorithms.	Investors	% Commission for transaction	2

Source: Author elaboration based on interviews and web information.

Table 5c: Mexico Crowdfunding PFs, 2013

Nu m.	Plat- form Firm	Laun- ching in Mexi- co	Clients Len- ding	Suc- cesfull cam- paigns fund- ed	Plat- form Fees	Target Market	Sta- ge of the plat- form	Origin	Total financial volu- me (USD)	Platform Income
10	Fon- deado- ra.mx	June 2011	Re- ward	121	6.50 %	Entre- preneu- rship/Ar- tists	1	Mexico	\$ 800,000.00	\$ 52,000.00
11	Crowd- fun- der.mx	Novem- ber 2011	Equity	805	5.00 %	Entre- preneu- rship	3	Mexico/EE.UU.	\$ 4,100,000.00	\$ 205,000.00
12	Idea.m e	Februa- ry 2011	Re- ward	57	10.0 0%	Entre- preneu- rship/N on- profit	1	Argentin	\$ 300,000.00	\$ 30,000.00
13	Kiva.or g	Octo- ber 2006	Crowd- lending	22,00 0	0.00 %	Entre- preneu- rship	3	EE. UU.	\$ 10,500,000.00	\$ -
14	Pres- tade- ro.com	June 2012	Crowd- lending	204	4.00 %	Entre- preneu- rship	2	Mexico	\$ 840,000.00	\$ 33,600.00
1	Kubo Finan- ciero	Novem- ber 2012	Crowd- lending	640	4.31 %	Entre- preneu- rship	2	Mexico	\$ 1,100,000.00	\$ 47,410.00
<b>TOT AL</b>				2382 7					\$ 17,640,000.00	\$ 17,640,000.0 0

Source: Elaboration based on data from ( BID Fondo Multilateral de Inversiones, 2013).

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## COWORK SPACES: COLLABORATIVE GREY ZONES<sup>1</sup>

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### Introduction

We look out into the freshly established cowork space in central Oslo which is silent as a graveyard, with the exception of one remarkably loud young man in the corner, practically yelling into his phone while seven teams of young start-ups are scattered on different desks around the room, staring fixated into their computers. “We need to get people talking to each other” the eager co-founders insist. “We need to make them understand that this is a collaborative space, a place we share; a place we help each other; a place we create wild stuff together”. The tone is borderline religious.

The coworking space in the making before us is one a myriad of cowork spaces, growing rapidly in urban areas all over the world. These hybrids of organizations and movements are the muses of everyone interested in collaborative creativity, an idea that has been steadily growing as a model for the modern workplace. They feed on the silent promise of collective ways of working, that deliver innovative possibilities, or as Moriset phrases it; they are “serendipity accelerators” (Moriset, 2014). While many organizations recognize the merits of collaboration and forming community (O’Mahony & Lakhani, 2011), organizations have long been viewed as structures that inhibit genuine relationships (Spreitzer et al., 2015). Coworking spaces, on the other hand, are often presented as part of a “sharing economy movement” explicitly seeking to break down traditional relationships of power (Schor et al., 2016). Various forms of shared social participation and collaborative activities are perceived to be what distinguishes coworking practices from other forms of shared physical workspaces like serviced offices, coffee shops or business incubators (Waters-Lynch, M et al., 2016). Coworking is here hence not just about working alone together or alongside each other in a flexible and mostly affordable office space. The social mission is very clearly formulated in The Coworking Manifesto, an online document signed by members of more than 2500 coworking spaces (coworkingmanifesto.com). The document states a number of values that the coworking movement aspires to, amongst those community, collaboration, openness, diversity, and sustainability.

<sup>1</sup> The title idea of the gray zone was inspired by the great work done on creativity and innovation in the police force by phd Mia Rosa Koss Hartmann (CBS/currently MIT). She used the term to capture the many different types of creativity, the same myriad of practices and understandings I find true for collaborative work.

While the idea of collaboration is highly seductive, our understanding of the collaborative patterns is still underdeveloped (Toivonen, 2013). The purpose of this paper is thus to address the topic of collaboration by empirically exploring collaborative practices amongst members of cowork spaces. Outside the constraints of a formal organizational or hierarchical structure people are, at least theoretically, free to collaborate at any rate or any intensity they want. Cowork spaces might thus provide insights regarding how to successfully enhance collaborative relationships and logics in the world of work, a world increasingly being interpreted as a service environment with collaboration at its core.

## Methodology

The study design is explorative and inductive and focuses on the question of how members of coworking spaces work, engage in and reflect over their collaborative practices.

The paper draws on data gathered during a 6 month long ethnographic observation of one cowork in Oslo and twenty in depth interviews conducted with members and managers of this cowork space and two more cowork spaces in Oslo and Copenhagen. The data collection started October 2016 is ongoing.

The combination of ethnographic observation and interviews is important here. Without a dense description of some of the contextual meanings to which collaboration becomes subjected in the cowork spaces in question could end up with a thin and superficial understanding of the collaborative practices and the ongoing exchanges. The combination of the two makes it possible to explore the dynamics of the space and the relations in it, as well as the individual experiences of the collaborative practice.

The ethnographic observations have included weekly structured observations of interactions in the space, including daytime "workhours" and evening events. My approach during fieldwork has been to collect accounts in written field notes and observe patterns and themes I could work on and investigate in interviews as well as in further observations.

The interview material is both based on formal and informal interviews.

About half of the interviews were done in a more formal interview setting, where the interviews were extensively documented and the conversations transcribed. The other half of the interviews were more informal in nature, done in the context of evening events in the cowork space, making proper documentation difficult. In these cases, I have taken notes and written a more extensive field note after the interview.

The material has been coded according to the questions and recurring themes in the interviews.

In addition to this, I have used the coworking spaces' websites as secondary sources to support and contextualise the findings. The website of site 1 was in Norwegian, but the two other coworking spaces have webpages in English. Quotes from websites are my translations.

The three research sites were chosen because they all represent heterogeneous environments where different working styles and knowledges coexist. They were chosen because one can argue that they all fall under what Capdevila would conceptualize as coworking spaces seeking relational collaboration (Capdevila, 2014). The coworking spaces very actively adhere to the collaborative ideal and place themselves in a discourse revolving around urban creative spaces, bringing people and ideas together, collaborating, being hubs of knowledge production and knowledge dissemination. These coworking values are clearly promoted in self-descriptions of the coworking spaces.

More specifically, the coworking spaces in the research sample are as follows:

Site 1: A medium sized (450m<sup>2</sup>) On campus cowork for student start-ups in Oslo, Norway. Members are nascent entrepreneurship, within all fields.

Site 2. A large cowork in Oslo, Norway (1000m<sup>2</sup>+), mainly targeted at creatives and cultural entrepreneurs, with a rapid growth rate the last couple of years.

Site 3. A very well established cowork in Copenhagen, Denmark (1000m<sup>2</sup>+), hosting a wide variety of professions, both entrepreneurs and creatives.

Nine of the people interviewed are nascent entrepreneurs from a range of different fields; from tech, to social entrepreneurship, to online learning; four are independent workers/freelancers in the fields of media and journalism; four are entrepreneurs in fashion, graphic design or sports and three are community managers.

The interview sample is biased towards young adults aged 25–34, because sharing economy sites are disproportionately used by people within this age group (Bloomberg, 2015, in Schor et al. 2016)).

Respondents were asked to participate after interacting with the researcher during participant observation. Everyone that were approached were willing to be interviewed. There was no screen for length of participation; however, most of the people interviewed had at least three months of experience at their site.

The interviews were primarily conducted in Norwegian, with two exceptions with English speaking coworkers. I translated them into English for analysis and the quotes used are from my translations.

There is a complexity issue in terms of language. Collaboration is not clearly understood word in Norwegian, so I have in the interviews often used several phrases to try to capture the term, will use phrasings such as “work together”, “create something together” or even community and interactions.

When citing direct quotes the names and identifying details have been changed.

This is the preliminary analysis of existing data.

Collaborations and exchanges in cowork spaces

The rapid growth of the cowork spaces is inherently linked to urban places, and coworking spaces can be regarded as a new form of urban social infrastructure enabling contacts and collaborations between people, ideas and connecting places (Merkel, 2015).

One of the simplest and most well established definitions of cowork spaces is presented in the work of Kojo and Nenonen who define co-working spaces as membership-based workspaces where diverse groups of freelancers, remote workers entrepreneurs and other independent professionals work together in a shared, communal setting (Kojo and Nenonen, 2016). However, what this notion of “work together” actually means, is, less clear.

Coworking tends to be presented as culturally embedded in the seductive discourse and practices of collaborative consumption, the ‘sharing economy’ (Botsman and Rogers, 2011) and the open source movement (DeGuzmann and Tang, 2011, Merkel, 2015). One of the earliest academic references to coworking spaces is in fact, found in an article by Aguiton and Cardon from 2007, relating coworking to the open source movement. The then nascent coworking practices were analysed as one expression of the rising strength of Granovetter’s (1973) weak ties and characteristic of the ‘weak cooperation’ visible in web 2.0 practices. The authors pointed out how in a cowork space, as in an open source community ‘a user discovers cooperative opportunities only by making their individual production public’. This way, they argue, that these spaces can be seen to sociologically represent a ‘new articulation between individualism and solidarity’ (Aguiton and Cardon, 2007).

From this early vision of the transformative power of cowork spaces, the term is used to label a wide variety of workplaces, some of which actively nurture the idea of open and egalitarian exchanges (Schor, 2016), but not uniquely so. There is done some initial work on conceptualizing and structuring our understanding of collaborative workspaces (Lange, 2013, Spinuzzi,

2012, Capdevila, 2014; Spreitzer et.al 2015 amongst others), though the work is still perceived to be in early days (Capdevila, 2014). Spinuzzi (2012) makes a useful distinction between collaborative and non-collaborative coworking spaces. He terms the former as “good partners” and the latter as “good neighbours”. Good partners in Spinuzzi’s work aim for work in cooperation with others, mainly using the space as networking tool to develop work and ideas and building a working trust that could lead to partnership or subcontracting. Good neighbours, on the other hand, work in parallel with others, wanting to interact with each other socially, sometimes gathering feedback from those in different fields, in Spinuzzi’s words “building a sort of neighbourly trust”. While not aiming to necessarily actively collaborate, they are committed to sharing and improving a communal space. (Spinuzzi, 2012).

Capdevila has a slightly different conceptualisation; distinguishing between three types of collaborations, often dominant in different types of coworking spaces (Capdevila, 2014). The first is a cost-based collaboration: The main goal of collaboration is based on the reduction of operational or transaction costs. The second is a resource-based collaboration: Agents collaborate driven by need of learning or having access to new knowledge and resources. The third is a relational collaboration: Agents engage in collaboration seeking synergistic results, investing actively in the community building dynamics. Practices focusing on relational collaboration are in Capdevila’s definition based on the premise that the outcome of collaboration is superior to the sum of the parts involved (Capdevila, 2014).

These distinctions are highly important, as they create very different contexts for collaborative practices to occur. Particularly the Capdevila distinction is helpful in the practical selection of coworking sites, and has informed the study.

Less work is done, however, on understanding why people collaborate, and under which circumstances members interact with each other (Gerdenitsch et al., 2016).

This is clearly a challenging question and can be approached from many different theoretical angles. There is very interesting study done by Schor et al (2016) that looks at exchanges in four different sites in the sharing economy; a food swap, a time bank, an open learning platform and a non-profit makerspace. As we can recall from earlier in the text, also coworking spaces are often defined in under the sharing economy umbrella, making the study highly relevant to our context.

The study uses Bourdieusian theory and concepts from relational sociology to analyse exchanges in the space, being particularly interested in how class and other forms of inequality operate within this type of economic arrangements. The study finds that while the discourse on open access and equality of opportunity, is strong, there is considerable evidence of distinguishing practices, a finding it labels the “paradox of openness and distinction” (Schor, 2016). Schors’ work illuminate the relevance of an economic sociology framework in understanding why we exchange goods or services the way we do. Much of the inquiry in economic sociol-

ogy has to do with behavioural puzzles regarding economic transactions (Garcia, 2014). In the Schor study, she applies two concepts developed by Viviana Zelizer, a pioneer in the field of economic sociology; circuits of commerce and “good matches”. This is also the theoretical framework for this study. By “commerce” Zelizer (2004) invokes the old sense of the word, meaning conversation and mutual exchange. A circuit is a type of social network organized around economic activity, but it is not just a network, because it contains specific understandings, practices, obligations, rights, symbols and media of exchanges (Zelizer, 2007, 2010). Broadly speaking, circuits of commerce contain within them specific understanding of how participants should do business. That is, their members abide by specific conventions – habits, routines and norms – which are a shared way of doing things that enable participants to meet each other’s expectations. In addition, the members of a circuit share a sense of boundaries. Zelizer’s circuit of commerce can be a useful framework for understanding collaborative practices, as it conceptualizes well this intermediary between network and market and community. While circuits can exist in all contexts, the concept has mostly been used outside of formal economies, such as the new type of organization that a co-work space represents.

She identifies five criteria a pattern of interactions must possess to constitute a circuit of commerce, rather than a market or a social network. These are social relationships among a group of individuals, economic exchanges stemming from those relationships, a common system of evaluation and accounting, shared meanings of exchanges, and boundary-defining membership in the circuit (Zelizer, 2010).

The other concept is “matches” (Zelizer, 2010, 2012). In her account, a match is good when it “gets the economic work of the relationship done and sustains the relationship” (Zelizer, 2010:153). As Schor points out, Zelizer’s concept of a “good” match, despite its terminology, is not normative (Schor et al, 2016). Good matches are those that happen, are viable over time, and sustain relationships. In the world of coworkers, a good match could happen between people who want to share information with each other, or trade skills, services or the like. Failed matches on the other hand, are transactions that do not occur because the parties cannot come to agreement about the meanings of the exchange- whether it is about price, quality or any other factor. A robust circuit of exchange is a circuit that is able to create enough good matches to ensure a sufficient volume of transactions.

Collaborative practices: The exchange

The movement

Any discussion of the collaborative new work life need to take into account the context of collaboration. The cowork spaces in question are by no means neutral spaces.

When you visit all three places the physical space is filled with a myriad of artefacts, such as posters with colourful messages of the power of exchange and collaboration. The collaborative

discourse is strong and very present both offline and online. Particularly in case 2 and 3, the text on the webpage is crystal clear on the collaborative positioning of the cowork:

"We believe that collaboration is the new competition. We accelerate passionate people and ignite great ideas". (Cowork 2)

"We are open for all trades and we encourage co-creation and mutual inspiration" (Cowork 3)

"We cherish working with other passionate people and understand the value of sharing knowledge and network". (Cowork 1)

If you are offered a place in any of these spaces, there is no way you will have missed the social contract of collaboration and community that you are expected to adhere to. The open, welcoming community fostering the collaborative movement is embodied by a community manager in all three places. The prime role of the community manager is curating collaborative environments, introducing new members, arranging social events, etc<sup>2</sup>. The frequency of the events varies between the spaces, but all have weekly or monthly non-formal meetings for coworking members to share updates and ideas as well as a myriad of other voluntary arrangements that have the specific aim of gathering people. Many of the events host speakers (either members or not) from the entrepreneurial or creative scene.

The collaborative ideal these spaces so clearly nurture, support and aspire to, is important for analysing ongoing collaborative practices.

The ideology of the movement is reflected in all of my in-depth interviews and conversations with co-workers. The people I interview talk about their cowork membership as more than just a mere fee for a practical work facility or, in the case of the student cowork, an available desk, late opening hours and kitchen facilities.

Sometimes it is difficult to distinguish if this is really felt, or if this is an embodiment of a discourse the members surround themselves with. But even the most mundane silent coworker talk about the collaborative potential of the space, how it differs from what is either their experience or their image of "the offices of the organisation". The cowork space is seen to represent any almost utopian space of fairness, openness and deep community founded on wanting to be enriched by and with others.

During interviews, many of the members specifically talk of their own human agency, and how they actively want to participate in a movement that work to foster a new more collaborative, "giving" and stimulating work life.

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2 See Merkel's work on the curating role of community managers (Merkel, 2014)

## Bricolage of informal exchanges

You enter any of the three coworking spaces in the sample any workday of the week. There is a humming sound, soft, non-intrusive, at least most of the time. You would observe brief exchanges at the desks, but most of the encounters take place in the more social zones. You see small groups of people discussing intensively over a cup of coffee; you see two men hunching over a rough hand-written sketch, you see a man with a strange helmet on his head, explaining the prototype of a helmet stimulating brain creativity to a handful of attentive listeners. There is obviously an ongoing intensive exchange of knowledge, contacts, and skills.

When I ask people to describe collaborations in the workspace most of the people I interview emphasise the soft sharing of knowledge happening in everyday interactions of the space. People rarely describe that they sit down and do more formal collaborative work together with other coworkers. Most of the interactions and exchanges they choose to describe are informal, somewhat fluid. They talk about the casual exchange of ideas, the inspirations, the serendipitous encounters that enables you to think new thoughts. They talk about being faced with challenging and surprising questions, they describe valuable exchanges of easily transferable specific domain knowledge, such as knowledge about production facilities in Lithuania, or knowledge about a good and efficient translating service.

These bricolage of exchanges can at times include finding "gigs" or employment opportunities through these interactions. But the bulk of the collaborations people choose to discuss are informal, sometimes not even actually realized, but merely a potential "meet". Harald, a large hippie-ish bloke working on "block chain technology explain it this way;

" Sometimes the value lies in the mere presence of others. It lies in the potential question about your work, the potential presentation you might hold."

His perspective indicates that the social contract can be experienced as formative, even when not actively enforced.

The strong focus on informal exchanges is interesting to note. For many of the people interviewed it appears that the coworking space is a space that offers exchanges that money really cannot buy. How would you go out into the market space and buy a conversation that inspires you to think new thoughts? How can you buy an aspiration, or a piece of knowledge that you did not know you wanted or needed? In the cowork setting, they claim to experience these types of fluid knowledge transfers daily.

The fluidity described above is also what I observe happening in the workspace. Throughout the day, people sit concentrated at their desks, often with air plugs lugged in, and then they



move around, making short stops at different desks hosting people from a high variety of backgrounds, engaging in a range of very different conversations. Because the places are so dynamic, the constellations change, it is difficult, even if you wanted to, to tread the exact same path every day. Using the metaphor of the river, something has changed, even if only slightly so.

The notion of collaboration is hiding a myriad of different practices. And most of these practices are what the coworkers do not even call collaborations. They are a range of non-formal, soft knowledge exchanges of many different types of knowledge.

### **The good match? Subtle status hierarchies**

Since the types of collaborations are so many, and the collaborations are so fluid, the idea of a “good match”, as introduced by Viviana Zelizer is challenging to pin down. Good matches are central to the formation of circuits, and in this context, the members describe an experience of good matches, of exchanges being satisfactory for all parts. For a trade to occur in the coworks in question, participants must not agree on set terms. It is not like in a food swap, where a trade is being haggled. There people have to agree that their jar of jam is equivalent in value to another member’s loaf of banana bread. In the realm of the cowork, the rules of exchange are clear, as is the trade itself. What qualifies as a trade and what is a non-trade is non-intuitive.

In the interviews, none of the respondents discuss the value of each individual “exchange”; the fluidity makes that almost impossible. How can you value a tip? Can an introduction to a relevant possible business partner be traded equally for an inspiring discussion? Is me giving you one hour of youthful enthusiasm equivalent to you giving me one hour of specialized digital marketing skills?

The respondents do not really talk of trading dyads, though that might happen, more often they are trading triads, or trading with the more impersonal “movement”. People describe a “culture of helping”, a culture of people that willingly share their knowledge, their skills with other members of the space, rejecting logics of hierarchy and power.

As one of the members Paal phrase it very bluntly;

“Ask anyone, you will get a yes” (freelance graphic designer, DK)

Helena, one of the long-time coworkers say the following about the culture of helping;

“The cowork space is a community, and while I might help someone out one time, with a piece of advice, an invitation to a network meet, they are not expected to pay me back. We all contribute with our knowledge, our skills, but we give to the community as such and the community gives back”(media entrepreneur, Oslo).

However, there are some indications of important, but subtle distinctions, distinctions one could think have an impact on the exchange. There is a clear sense that some skills and traits are found more attractive than others, and with that, the person holding them. This comes to surface in several ways. Some traits are mentioned far more often than others, such as being connected, being creative, being visionary and being driven.

Some people are mentioned several times during interviews and talked about very complementary in phrases such as, “oh, he is really really good”, or “she is extremely well connected”. Trades and connections with these members are frequently brought up in conversations. As an example of these distinctions: when one of the members explained his interactions with new members, he emphasizes how he relates most strongly to the members who are passionate.

From the interviews and observations, it seems that the cases where good matches fail to occur are where members fail to adhere to the quite explicit group norms of the cowork space and the cowork movement. Several of the interviewees mention the frustrations of people who “don’t get it” (their words). These are people who do not find a match, who do not “fit in” or are not seen to truly embrace the movement’s ideals, not balancing right between individualism and solidarity, referring back to Auiton and Cardon’s analysis. In the cases of bad or no matching, this was often people who tended to be seclude themselves from the environment, not partake, and slowly drift away. As Lisa, one of the community managers says when we talk about the members and who thrive in the space,

“I see that getting people to engage in the space is very important. The people who arrange stuff, talk to lots of different people, engage themselves in the cowork, they are the people who stay long and thrive here” (community manager, DK).

There are also signs of uneven matches. In the interviews, as well as during the ethnographic observations, I find that some people see themselves as engaging in voluntary unequal matches, where they are giving, far more than getting (interestingly, no one describes themselves as purely on the receiving end). There is a one sidedness, though they talk about it with great ease. Haakon, a well spoken, confident, almost a bit overly enthusiastic guy talked highly of his helping hand:

“I help people as much as I have time for. I feel I give help more than I receive, but it is ok. It makes me feel good to help out” (nascent online learning entrepreneur).

With these interviews in the back of the mind, observations and my perception changes somewhat. I start to notice that despite the almost random fluidity, there are some people who are clearly approached more than others. Some get a slightly more intense “hi” when they walk

into the room. Some circulate the crowds more than others.

My analysis points to a range of trades happening, and a range of good matches. But in this bricolage of collaborative practices, mostly informal, there is a lack of clarity in terms of what things are worth. In this grey market of interactions and “collaborations” (though they rarely use the word) we see subtle hierarchies being present, albeit under the discourse of openness and equal worth. The performance of distinction can, if developed further, impede the ability of participants to make trades or create “good matches”. Inequality challenges the construction and reproduction of the circuits of commerce.

### **Coworking spaces as robust circuits of commerce?**

The study gives increased depth to our understanding of collaborative practices in these new creative spaces in the urban economy. All three sites were chosen to fit Capdevila’s definition of a space fostering relational collaboration: Agents engaging in collaboration seeking synergistic results, investing actively in the community building dynamics (Capdevila, 2014).

The point of this was to investigate the phenomenon of collaboration in a site that potentially could give us richest possible data on the phenomenon.

The analysis points to a number of interesting discussions:

For one, what constitutes “deep” collaboration? Relating the preliminary findings to the existing literature, I find that the interactions in these coworking spaces in many ways fall under the “good neighbour” category of Spinuzzi (2012), mainly because the focus on informal collaboration is so strong. While the “good neighbour” categorization does not quite capture the intensity of informal collaborations I find in my material, and the distinction between parallel work and cooperative work as somewhat more diffuse, the split between formal and informal that Spinuzzi points to is very present. The strong collaborative discourse in my material might be natural as the sites in the sample all actively embrace the collaborative ideal of the cowork movement (ref. Capdevila’s definition of relational collaboration) but it is still interesting to note that the findings suggest there is an almost anti-drive towards formal partnerships.

While more studies are needed to explore why that could be the case, it is possible to hypothesise that the formal route of formal partnership with fellow coworkers is perceived to be too slow, too committing or too predictable, and that the value of the cowork space is in the fluid knowledge transfers that the collaborative culture embodies. Perhaps cowork spaces exhibit the economic world in reverse, whereby the most valuable collaborations are outside of the market economy while the transactions requiring a monetized or very formal collaboration are, almost ironically, perceived to be easier achievable.

While the analysis is preliminary and more data will be gathered to strengthen the findings, this could potentially be important in many regards. For one, it frames an interesting discussion for practitioners about how to curate a collaborative community without interrupting the fluidity as well as the agency of the workplace. Both traits are seen as unique and powerful aspects of the cowork culture.

Another interesting discussion is how coworking spaces can and should curate “good matches” and robust circuits of exchange. This study of cowork spaces finds many of the same dynamics as identified by Schor’s study of four different sites in the sharing economy. While the cowork spaces do not fully satisfy the criteria of Zelizer’s circuit of commerce, due to unclear logics of value and worth, they do fit the what Schor defines as “circuits in construction” (Dubois, Schor, & Carfagna, 2014) emphasizing their emergent nature. As in the case of food swaps, timebanks, open learning and non-profit makerspace, cowork spaces embrace, and prominently articulate an ethic of accessibility, openness, and equal opportunity for all. And, again, as in Schor’s study, I find evidence of distinguishing practices and unequal trades (Schor et al., 2016). For all these sites in the sharing economy, there is a dilemma of openness and the wish to create equal trades; or in her words; “constructing circuits that are both egalitarian and robust” (Schor et al., 2016).

Again, the analysis is preliminary, but suggests an interesting discussion about the stability of the cowork community. Curating various market like installations could possibly help mediating the informal collaborations and facilitate better matches in Viviana Zelizer’s words (2010). But combining the informal collaborative practices and the need for more equal exchange is difficult, and it is not given that market like structures, such as incentives or a social currency, introduced by a number of coworking spaces, is going to be the answer. Another question one can ask is can one allow one-sided trades or unequal trades and still accord with to the underlying vision of the cowork movement if the structure – being the individual cowork space or the movement itself - is strong enough to take on the promise of exchange over time? Good matches are not necessarily being secured by dyadic trades, but between the individual and the movement. The empirical data tells a story of highly motivated cowork members, faithful disciples of the movement’s collaborative ethos. There is a sense from the material I have analysed until now, that the culture of collaboration lays a smooth layer over unequal trades. The structure might compensate for individual inequalities. Whether this could be true for a robust circuit of exchange is less clear and should be explored. This could further lead to a discussion about the importance of building a cowork brand, and the enhancing and manifestation of the collaborative vision.

## Conclusion:

This paper is a preliminary analysis of existing primary data. I am particularly aiming to strengthen the ethnographic analysis of the two last cowork sites, as well as conducting several more interviews exploring emerging topics. However, it does have some interesting suggestions.

Coworking as an urban social practice highlights alternative ways of organising work life, nurturing an endearing collaborative discourse. There is a strong interest in cowork spaces as a way to foster collaborations, but there is clearly need for a better understanding of the collaborative practices and their curation.

The paper shows how circuit of commerce can be used as a framework for analysing collaborative practices and motivations in a community context. In fact, a circuit of commerce might be a better framework for understanding coworkspaces than communities, as the framework clearly emphasises that cowork spaces are spaces where exchanges happen.

This paper has applied the notion of circuits of commerce and “good matches” to an analysis of the daily collaborative practices amongst coworkers. The objective was to highlight that collaboration is an exchange between workers and between workers and structure, and that reaching a good match is challenging. The preliminary analysis of data from three cowork spaces in Scandinavia indicate that there is a large collaborative grey zone where collaborations come in many shape and forms, being more adhoc, less formal and sometime almost weightless, with people claiming to be inspired, led and challenged sometimes merely on the basis of the spaces’ collaborative potential.

I find, mirroring Schor’s research on four sharing economy sites (Schor et al., 2016), that they exchange values often are unclear, and some indications of distinguishing practices that can undermine the relations of exchange and create difficulty completing trades. This results in many inconsistency, which Schor calls the “paradox of openness and distinction,” between actual practice and the sharing economy’s widely articulated goals of openness and equity.

There is yet a lot of work to be done before we know more about how to successfully enhance collaborative relationships and logics in the world of work. Paradoxically, the call for more curating and management of collaboration could result in less collaboration: because collaboration is understood so differently among cowork members, and because the bricolage of informal collaborations is not fully recognized as collaboration, even among the collaborators themselves. Because so much of collaborations occur in the non-formal work life structures, the formal system might not be able to increasingly support these kinds of collaborative practices.

The idea of “managing for collaboration” could potentially lead to a tension between divergent interests from those of the collaborative leadership, eager to “prove” and measure collabora-

tive practices and the cowork collaborative potential, and the coworkers themselves, many of whom express that they experience meaningful work lives with serendipitous encounters.

Organisations might be seen to inhibit genuine relationships, a quality cowork spaces are seen to tender well to. However, while the relationships are perceived to be genuine, they are not perceived to be created equal. And while the cowork brand and movement currently compensate for unequal matches among cowork members so actively adhering and embracing the collaborative ideal, the long-term stability of cowork spaces and their role as creative spaces might depend on coworking spaces facilitating a higher number of “good matches”. This might challenge some of the ideals of the democratic, heterogeneous, open, urban village.

Cowork as a service is co-created and its success depends not only on the will and strategy of the management team but also (and more importantly) on the will and actions of the members of the coworking space (Capdevila, 2014). As of now one of the key aspects of cowork spaces is the power of strangers wanting you well. Which is more than the traditional organisation, or the random urban space is seen to promise to provide.

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## CSR AS A VALUE PROPOSITION: EXPLORING THE EFFECTS AND DRIVERS OF SWEDISH REAL ESTATE FIRMS' GREEN BUILDING CERTIFICATES

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*Corporate social responsibility (CSR) has been widely diffused and it gets manifested through the stakeholder relationships a firm. We do in this paper investigate CSR certificates and their impact on the adopting firm. We explore real estate firms – a conservative industry that traditionally have had a very strong financial focus where their market strategy has followed a strict goods-dominant (G-D) logic but where some firms changes their mindshift towards service-dominant (S-D) logic thinking. Thus, we build on multiple sources of data to explore Swedish real estate firms and study their approaches to CSR. Our results offer some insights in the characteristics of firms with green environmental certification systems and it has implications for how theories on value cocreation needs to be developed.*

### 1. Introduction

Both research and business practice has learned that being socially, environmentally, and ethically aware pays-off (Vlachos, Panagopoulos, & Rapp, 2013) in the form of e.g., reputation, customer loyalty, financial performance. The research in this area goes under the umbrella concept corporate social responsibility (CSR) which encompasses a variety of topics of study (Aguinis & Glavas, 2012). The reasons for adopting CSR has been described in terms of intrinsic versus extrinsic motives (Story & Neves, 2015) as well as being driven by competitiveness, legitimation, and ecological responsibility (Bansal & Roth, 2000). Basically, firms that adopt a CSR strategy will add a plus in their current offerings. With the advent of service-dominant (S-D) logic a discussion within the marketing community – where prior thinking and axioms are being challenged – has been spurred. Not only does the work by professors Steven Vargo and the late Robert Lusch challenged the way of thinking – moving from a goods-dominant (G-D) logic with a focus on products and *value-in-exchange* to a focus on service and *value-in-use* (Vargo & Lusch, 2004, 2008, 2016) – it has also rendered a new lexicon where previous roles and market functions been challenged (Vargo & Lusch, 2011). Following S-D logic, a firm's CSR ambitions needs to boil down to a *value proposition*, i.e., something that will lead to customer value-in-use. This is a change from the prior G-D logic approach where CSR needed to be included in the entity that was exchanged (usually a product) following a value-in-exchange thinking.

Firms that strive to make CSR a value proposition will not only need to reframe their own business, they do also need to interact with their customers and other stakeholders to make their offering viable and understandable. Thus, they need to engage in institutional work (Koskela-Huotari, Edvardsson, Jonas, Sörhammar, & Witell, 2016; Vargo & Lusch, 2016). Whilst CSR can be an attribute that induces trust and loyalty within a business relationship (Homburg, Stierl, & Bornemann, 2013), research has also shown that it has a positive effect on customer value cocreation (Luu, 2017). Thus, having a S-D logic mindset rather than a G-D logic mindset when adopting CSR should produce favorable outcomes. However, this translation requires a relational mindset and a shift in capabilities and resources (including staff) to avoid what Gebauer, Fleisch, and Friedli (2005) described as the *service paradox* and what later has been referred to as the 'servitization paradox' (Kastalli & Van Looy, 2013). This stream of research has followed manufacturing firms and noted that the shift towards more services has not been shown in the financial performance; rather the opposite. And a reason can be that the firms not fully has embraced service thinking.

We do in this paper aim to empirically explore what characterizes firms in the real estate industry that are early adopters of CSR practices from those who don't. We do furthermore strive to investigate if there is a difference between the firms that adopt CSR in a traditional G-D logic way and those that adopts CSR following S-D logic thinking (i.e., striving for customer value cocreation). What separate firms that adopts CSR as a value proposition from those that in a traditional way associates it to the brand (Du, Bhattacharya, & Sen, 2010)? We do also aspire to understand if there is a difference when it comes to the firms' CSR commitment. Managers we interviewed differentiate between "green talk" and "green walk," i.e., being fully sincere and ambitious about a CSR strategy or only using it for branding and exposing purpose. Following this, we aspire to bring CSR into the S-D logic realm which we argue is a natural step given for a true CSR strategy given that a CSR investment should both affect the performance metrics of the adopting firm but also cause change (i.e., value cocreation) among the firm's customer.

As a mean to fulfill our aim we address the real estate industry – a conservative market that traditionally have had a very strong financial focus where the dominating market strategy has followed a strict goods-dominant (G-D) logic with a focus on return on assets. Increasing energy prices, a heightened environmental awareness, as well as a mind shift towards S-D logic thinking has been manifested in building environmental certification systems (e.g., BREEAM and LEED), green leases, as well as a mindshift where progressive service-oriented real estate firms put forth their offerings as value propositions rather than 'a nice space at a good location'. The conservative characteristics of the real estate industry allows us to: (a) distinguish firms that are early adopters of CSR as well as (b) investigate if there is a difference whether this is done in a traditional (G-D logic) way or focusing CSR (in a S-D logic) as a value proposition. Finally, (c) get some insights into what degree early adopters engage in institutional work.

## 2. Literature review

Among viable service research priorities concepts as ‘well-being’ and ‘transformative service’ (Anderson et al., 2013) show that the service community has an aspiration to act on the global challenges. S-D logic has the potential to diffuse CSR as a part of firms’ value proposition and we see some early conceptual work that integrate aspects of CSR with S-D logic as Luca, Hibbert, and McDonald (2016) that discuss S-D logic and social marketing as well as Matthies et al. (2016) that address the environment with a S-D logic lens. Overall, S-D logic offers avenues to a better understanding on how markets are shaped and become shaped on a macro level why further studies are needed (Vargo & Lusch, 2017).

S-D logic did early make a distinction that G-D logic – that focused the exchange of a good, i.e., *value-in-exchange* – offered an incorrect view on market exchange and that firms did instead aimed for *value-in-use*. Overall, S-D logic resulted in a new lexicon (Lusch & Vargo, 2014) which holds S-D logics central foundational premises whereas some has been given axiom status (see Table 1 below). Following Vargo and Lusch’s seventh foundational premise ‘Actors cannot deliver value but can participate in the creation and offering of value propositions,’ the best thing firms can do is develop value propositions that allows the customers to cocreate value and experience value-in-use (and lately discussed in terms of value-in-context). Thus, “S-D logic reframes “value” from a property of output to an experiential outcome, a measure of a change in viability, wellbeing” (Vargo & Lusch, 2017, p. 54).

**Table 1.** Service-dominant logics foundational premises and axioms (Vargo & Lusch, 2016)

Foundational Premise	Axiom	Description
1	1	Service is the fundamental basis of exchange.
2		Indirect exchange masks the fundamental basis of exchange.
3		Goods are a distribution mechanism for service provision.
4		Operant resources are the fundamental source of strategic benefit.
5		All economies are service economies.
6	2	Value is cocreated by multiple actors, always including the beneficiary.
7		Actors cannot deliver value but can participate in the creation and offering of value propositions.
8		A service-centered view is inherently beneficiary oriented and relational.
9	3	All social and economic actors are resource integrators.
10	4	Value is always uniquely and phenomenologically determined by the beneficiary.
11	5	Value cocreation is coordinated through actor-generated institutions and institutional arrangements.

S-D logic does also bring forth the importance of knowledge given that value cocreation demands that all the involved actors understand what kind of resources they have and what others bring to the table (Ranjan & Read, 2014). Thus, we can expect firms that follow a S-D logic way of thinking form their offering as a value proposition and that they show a clear customer learning component (Hibbert, Winklhofer, & Temerak, 2012).

## 2.1. Institutional Work

When trying to change the practice within a market, we can expect that firms will face resistance. Vargo and Lusch (2016) emphasize that this part of market work is so essential that it has been the last added axiom (see axiom 5 in Table 1). It is the ‘actor-generated institutions and institutional arrangements’ that sets the agenda for what is considered a value-in-use, i.e., we have through the current institutions a sense of what an offered service is ‘worth.’ Thus, reframing a market offer does also require that the customer is in sync and that the new offering (that is; value proposition) are considered valuable. Apple iPhone and Spotify did, for example, create new markets for which previous institutions had limited bearing. Thus, new institutions were created which also rendered price models that corresponded to the customers’ experienced value-in-use.

Firms that aim to change their way of acting in an industry will engage in institutional work (Lawrence & Suddaby, 2006). When adding services or reframing the firm offering from being a ‘goods’ (value-in-exchange) to a service (value-in-use), it will also result in firm activities aimed at changing or reframing institutions (Koskela-Huotari et al., 2016). This institutional work may span from affecting the way we see things (i.e., the culture-cognitive element of institutions), how we think it should be (normative element), or the way laws and de factor practices are specified (regulative element), see Table 2 for an overview. It is also worth noting that all of these elements can be evident at once, but to different degrees (Scott, 2014).

**Table 2** – The three pillar of institutions (Scott, 2014)

Area	The culture-cognitive pillar	The normative pillar	The regulative pillar
Description	Shared conceptions that constitute the nature of social reality and create the frames through which meaning is made.	Rules that introduce a prescriptive, evaluative, and obligatory dimension into social life.	Institutions constrain and regularize behavior.
Origin	Sociology, organization studies.	Early sociologists.	Economists, political scientists.
Focus	The cultural and cognitive dimensions of human existence; shared beliefs/definitions, common frames, organizing logics and assumptions.	Values (preferred or desirable outcomes), norms (how things should be done), and roles (who does what due to social position).	Explicit regulatory process; rule-setting, monitoring and sanctioning activities.

Institutions can in its basic form be described as the ‘rules of the game’ (North, 1990). Changing institutions is thereby changing the way of playing the game. A common way to describe institutional work is to address both the conformity to current institutional elements (i.e., ‘maintaining institutions’) and the striving to change the current institutions (i.e., ‘disrupting’ and ‘creating’) (Lawrence & Suddaby, 2006). Earlier research on institutions has shown that firms within an organizational field seems to mimic each other (DiMaggio & Powell, 1983) and that there develops a practice within the business network. We do in this study address the real estate industry which can be considered a conservative organizational field which we expected to be dominated by actors that maintain the institutions.

## 2.2. CSR and the Value of Certificates

The real estate industry has traditionally been seen as a utility and financial market which is reflected in its related scientific journals that follows econometric thinking rather than managerial theories (Hardin, Liano, & Chan, 2006). The focus of real estate managers has thereby been to uphold the value of the property through careful maintenance. Dealing with tenants has been a necessary byproduct given that the attraction of the building is, besides strongly related to location and the building per se, related to its potential of attracting tenants and limit vacancies. However, the real estate industry has during the last decade been affected by changes that requires its actors to consider changes in their offerings. The increased adoption of building environmental certificates (Cole & Jose Valdebenito, 2013) as well as green leases (Sayce, Sundberg, Parnell, & Cowling, 2009) means that real estate firms have the chance to differentiate their offering, i.e., there might be opportunities for early adopters. Whilst the building environmental certificates can be seen as token for CSR (and hence be considered both from a G-D logic and a S-D logic perspective) we argue that the green leases that builds on a formal and regular interaction between the landlord and tenant (Janda, Bright, Patrick, Wilkinson, & Dixon, 2016) is an example of how an industry moves towards value cocreation and hence away from a G-D logic.

There are both domestic and international sustainability building certificates where BREEAM with origin in the U.K., and LEED with U.S. origin are the most internationally adopted ones (Gauthier & Wooldridge, 2012). These standards do not only focus the building and its energy and material use, but also the wider supply chain. However, several countries do also utilize national or regional sustainability building certificates as Sweden that has developed the Swedish Environmental Building (Miljöbyggnad) as well as adopted EU's 'Green Building.' It is the Swedish Green Building Council (SGBC) that manages the certificates in Sweden and the certificate can be a component that allows the adopting real estate firms to have premium prices (Bansal & Roth, 2000) given that green offices attracts customers (P. M. Eichholtz, Kok, & Quigley, 2016). Thus, they both become an important strategic and managerial issue.

Studies have shown how building sustainability certificates have a positive effect on the building's yields, its possibility to attract less price-sensitive customers, as well as attracting tenants that see it as part of their CSR engagement. But previous studies have mainly studied the adoption of building environmental certification systems as a dichotomy, i.e., only counted for a firm's first certificate and not the potentially subsequent – nor extent of number of – certificates (Gauthier & Wooldridge, 2012). Thus, we lack a more nuanced understanding of firms' different ways of adopting a CSR strategy that incorporates sustainability building certificate and how this is reflected in their business performance.

We do in this paper use an explorative approach to increase our knowledge on how firms that adopts building environmental certificates differ from others. The certificates can be seen as proxies for a CSR strategy (P. Eichholtz, Kok, & Quigley, 2010), but the motive as well as execution of that strategy are expected to vary. Thus, we make a difference between firms that uses the certificate as an added association to the 'goods' (e.g., to an office space) following a G-D logic and those who develops it to a value proposition (e.g., aiming to offer the customer a value cocreation opportunity) following S-D logic thinking. Thus, we try to see if having a S-D logic way of forming the CSR strategy (which practically would be manifested through a

value proposition approach and a learning orientation) adds momentum to the CSR offering. We do furthermore expect the later to require more institutional work.

### 3. Method

This study builds on data found in the firms' annual financial and environmental reports, SGBC's report on building environmental certificates, and other forms of public data. We apply a mixed method approach where we use (a) regression analysis to explore the effects from explicit CSR commitment on the financial status and development of the firms being active in green building certification, and (b) comparative analysis to find distinguishing factors when comparing the early adopters (i.e., certified) with the other (non-certified) firms in the real estate industry. Thus, we strive to both include the signal value of a CSR certificate as well as if a firm that embrace it as a service outperform those who don't.

To investigate the real estate firms CSR value propositions and their approaches to sustainability and adoption of green building certificates we used a dataset that spanned a six-year period (from January 1 2010 to December 31 2016). We relied on three data sets following a mixed method approach. First, we used SGBC's information on certified buildings and we used a dataset that spanned all the certified buildings until 31 December 2016. This dataset contains information about type of certificate, time of certification, buildings certified etcetera. Second, we collected financial data for the real estate firms involved in certification as well as the wider population of real estate firms. Third, we used two independent raters that codified the firms CSR approach based on annual reports, firm webpages, and other public information. The three data sources are elaborated below.

#### 3.1. Building Environmental Certificates

SGBC is the Swedish interest organization handling the green building certificates in Sweden and they offer information of the certified objects (buildings) and relate these to the certified firms. We aimed to collect data on real estate firms that are considered acting due to a market logic, i.e., not governmental or public organizations, nor other forms of firms that certified their own buildings (e.g., banks and other mainly large multinationals oriented towards manufacturing and engineering).

When evaluating the data based upon the firms related to the objects (buildings) it was clear that some firms certify their buildings on subsidiary level. Thus, we went over the data and condensed multi-organizational firms into one aggregated entity. This process resulted in that we ended up with 26 firms (out of over 400 firmnames registered as certifying firms by SGBC between 2010 and 2016). These firms were (fully) private real estate firms with over 200 certificates. However, we wanted to expand the numbers and investigated real estate firms with partial public ownership, but are still competing in a market logic. This rendered us a final set of total 34 firms accounting for a total of 594 sustainability building certificates. In the analysis, the variables in Table 3 (that are related to the certificates) will be used.

**Table 3.** Certification variables

Variable	Description
Number of projects	Number of certification projects the firm has been doing. This generally correspond to the number of buildings that are certified, i.e. one building per certification project
Certified Area	Area covered by the certificate, measured in thousands m <sup>2</sup>
Total Area	Approximate number of total area in the real estate firm's property, measured in thousands m <sup>2</sup>
Green ratio	Certified Area divided by Total Area

### 3.2. Business Data

Financial data was collected from Retriever Business, a business database that contains all official financial data for Swedish firms. Of the 34 firms, active in green building certification 2 are in firm forms other than limited liability firms ("Aktiebolag"). Because of differences in regulation, less financial information is available for these. The variables presented in Table 4 have been used in the analysis, both for year 2012 and 2015.

**Table 4.** Variables from the financial reports

Variable	Description
Employees	Number of employees in the firm
Turnover	Turnover (total sales) in MSEK*
Return on Assets (ROA)	Net Income / Total Assets. A profitability measure emphasizing return on assets
Real Estate Assets	Value of the real estate as listed in the public reports, in MSEK*
Real Estate Intensity	Real Estate Assets / Total assets. Showing the extent to which the firm's assets are made up of real estate
Equity ratio	Adjusted Equity / Total Assets. Showing the extent to which the firm is financed with own money
Personnel Intensity	Personnel Costs / Turnover. Showing how labor-intense the firm's business is

\*MSEK = Million Swedish Kronor

A comparative dataset of the wider population of real estate firms was also collected from the Retriever Business database based on the industry classification codes. The majority of the 34 certified firms are listed in NACE-code 68.2, Renting and operating of real estate, with a few listed as: 41.1, Development of building projects; 41.2, Construction of residential and non-residential buildings; and 70.1, Activities of head offices. Therefore, the comparative dataset was defined using NACE-code 68.2, which yielded 34 268 firms (not counting the certified firms). The same financial information as defined above was gathered for this dataset as a comparison group, but the variables related to certification and CSR activities are not available for these.

### 3.3. Coding CSR Approaches

To investigate not only the adoption of green building certificates – as well as how the certificate was used in the real estate firm’s market activities – two independent raters studied public information from the 34 real estate firms that made up the studied sample. To be able to see whether firms that embraced a value cocreation approach – and that actively worked with value propositions following S-D logic (Vargo & Lusch, 2016) – we coded if the real estate firm had a clear CSR value proposition (CSR\_vp) binary (i.e., 1 for present, 0 for absent), a variable that captures the normative institutional element of the firm. Second, the raters coded if the firm was offering green leases (Green\_lease); an indicator of a relationship orientation that also corresponds to the normative institutional element. Third, the coders search for clear indicators of that the firm’s CSR activities had a clear customer learning component (CSR\_learn), a variable that relates to a fundamental antecedent in S-D logics on customer engagement and that captures the culture-cognitive institutional element of the firm (Hibbert et al., 2012). Forth, the coders aimed to understand if the firm emphasized a customer value-in-use approach rather than had a traditional (G-D logic) value-in-exchange approach. Given that we strived to capture all three elements of institutions (Scott, 2014) and that real estate firms traditionally built on a financial focus, we coded whether the 34 firms had investors as their main stakeholder (traditional view). Thus, we used a variable (Invest) to codify if the firm had an investor-orientation rather than a customer (value cocreation) focus. We acknowledge that this variable also can be considered to measure if the firm focuses the building as a financial asset or an asset related to the customer. However, we used the variable’s inverted value as a proxy for whether the firm had a G-D logic mindset or if they embraced S-D logic thinking.

We did also want to control for whether the firm utilized their CSR engagement in their branding (CSR\_brand) and if the green certificate was part of the firm’s market communication (CSR\_marketing), both aspects of a traditional CSR strategy (Du et al., 2010).

## 4. Results

When reviewing the 1,352 certifications done 2010-2016, Sweden’s four largest cities had the most certified objects and this was also matched by the concentration of the private landlords’ certified buildings. Given that we aimed at analyzing the effects for private landlords we had to remove public landlords as well as firms in other industries that had certified their main office. Thus, we ended up with 594 certification projects (43,9%) spanning over 6 million square meter certified area owned by private land lords.

### 4.1. Types and Degrees of Commitment to Sustainability

The firms’ CSR activities differ in both type and degree also among those working with green building certification. In average, the 34 real estate firms have done 17 green building certification projects, with a range of 1-148. There is thus a great difference in the experience of building certificates. The certified area also varies, from



4000 m<sup>2</sup> to 2.4 million m<sup>2</sup>. What is more interesting is to set the certified area in relation to the total area, which is plotted in the graph below (see Figure 1). The certified share of the total area ranges from 0.6% to a full (even over) 100%. The top notation of 103% for the firm Vasakronan could be caused by the rough information found on the total area (2.4 million m<sup>2</sup>) or duplicate certificates. In average, 24% of the area is certified.

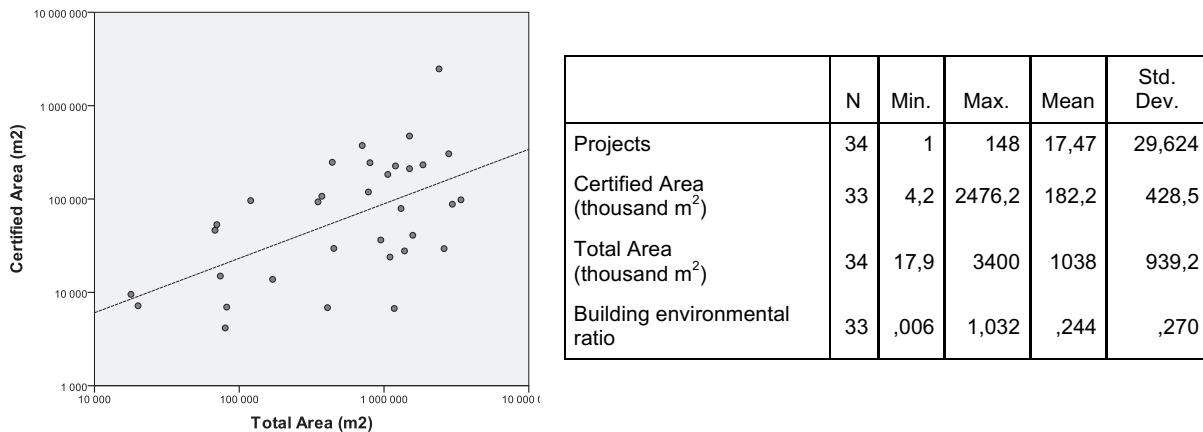


Figure 1. Descriptive statistics green building certifications

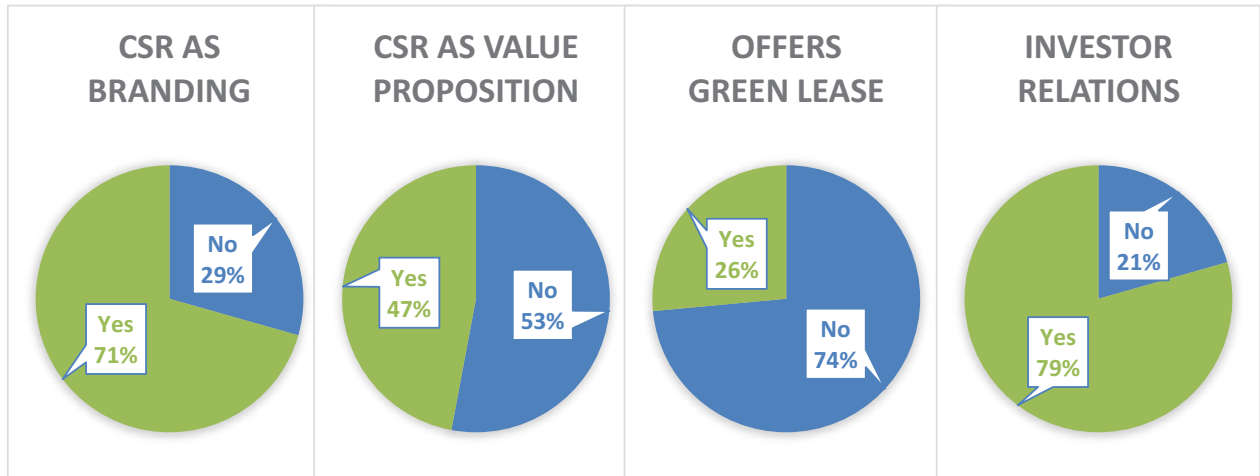
Getting green building certificates is an evidence of actually committing to CSR. The ratio of green area and the number of certification projects are thus signs of that the real estate firm not only do the ‘green talk, but also do ‘green walk.’

But how about real estate firms that do ‘green talk’? The qualitatively assessed indicators of CSR in marketing, i.e., using green in their branding efforts (CSR\_brand) represent some aspects of ‘green talk.’ As many as 71% present CSR-aspects in terms their brand. This typically take the form of giving the green building certificate a prominent place on webpages and on public material. Going beyond CSR as branding, which is not necessarily substantiated, bringing CSR as a core offering and hence as part of the firm’s value proposition (CSR\_vp; i.e., following a S-D logic) was found in 47% of the cases. This means a step from talking about CSR to formulating how it is integrated in the products and services, and how it will enable the customer to benefit from it. Firms in this group typically has more of a customer-oriented and dyadic tone in their public information that firms without a value proposition mindset (which usually was more focused on describing the features of the buildings per se).

CSR as branding and CSR as value proposition are two different (although not mutually exclusive) mindsets and approaches to taking CSR into the market offering. The branding aspect is more common, and perhaps it is an easier way to go. Formulating CSR as value proposition requires a more genuine packaging of CSR as a value creator; requiring a greater commitment to sustainability, and it is alsomore atuned with ‘green walk’ rather than mere ‘green talk.’

A further step to actual action is the firms offering green leases (Green lease), i.e. rental contracts with formalized and concrete CSR content that requires the landlord and tenants to interact and deal with sustainability matters on a frequent basis (usually at least once a year). Only 26% of the firms offers green lease although they have in-

vested in certifying the buildings. Certification is thus not primarily a “commodity” that is sold through specified contracts. To contrast the CSR aspects, the explicit recognition of investor relations (Invest) was mapped, as an indicator of the perspective on the firm as a return-generating unit. Communicating with investors is very common, as many as 79% of the firms were active towards these stakeholders, which shows the importance of that perspective. Whether the investors’ interests and values are in conflict with CSR is, however, not known. An overview of the firms’ approaches are offered in Figure 2 below.



**Figure 2.** Descriptive statistics of the 34 real estate firms’ approaches

The described variables address three different perspectives on CSR commitment. One is rather concrete and shows actual activities: the number of green building certificates, the area certified and the ratio of certified area to total area. They constitute the ‘hard’ commitment to sustainability. The other approach is more based on expressed ambitions and emphasizes relational scenarios and value co-creation: CSR as branding, as value proposition, and green leases. They are in this context ‘soft’ commitment to sustainability. Finally, as a contrast to CSR commitment, was the investor relations perspective. The correlation matrix (see Appendix) supports this view, and an Exploratory Factor Analysis further indicates three dimensions captured by these variables (see Table 5 below).

**Table 5.** CSR approaches

	Component		
	1 (Hard CSR)	2 (Soft CSR)	3 (Investor)
Projects	,801	,419	
Certified Area	,906		
Green Ratio	,814		
CSR as Branding		,898	
CSR as Value proposition		,843	
Offers Green Lease	,333	,504	
Investor Relations			,975

Principal Component Analysis, Varimax rotation.

To what degree can the approaches above be seen as doing ‘green talk’ versus ‘green walk’? The two are according to our results not mutually exclusive. It is possible to show commitment to CSR in both talk and walk. The investment perspective is furthermore neither positive nor negative connected to the CSR dimensions.

There is, however, a difference between firms that has a hard or soft approach to CSR versus firms that has an investor focus. The later does maintain the current institutions (Lawrence & Suddaby, 2006) whilst the prior two can be expected to engage in institutional work that focuses disruption or creating institutions. Certificates is usually related to the normative element of institutions (Scott, 2014), but the increased use of green leases as well as the transfer towards a value proposition orientation are also holding culture-cognitive elements.

## 4.2. Financial Status and Commitment to Sustainability

Potential effects of firms' commitment to green building certificate, and their profiling of their commitment towards customers, on the performance and development is sought through multiple-regression analysis. The regression models (see Table 6) show that the main impacting CSR factor is the *Green Ratio*, measured as the area covered by green certification in proportion to the firm's total real estate area. The effect on the profit, here measured as *Return on Assets* (ROA), is strongly negative. The effect is just over .10 in significance, but the indication is that profitability suffers from a high degree of green certification. The rational is most likely that the additional efforts required for certification are costly, as so is turning your product into a value-added offering. The indication is, however, that the increased costs are not matched by increased revenues to the same extent.

Table 6. Regression analysis

Dependent Variable	Return on Assets 2015	Personnel Intensity 2015	Real Estate Intensity 2015	Solidity 2015
Intercept	17,739† (10,167)	0,018 (0,106)	0,725** (0,212)	27,886* (10,382)
Projects	0,157 (0,46)	-0,007 (0,005)	0,018† (0,01)	-0,461 (0,469)
Certified Area	0 (0,028)	0 (0)	-0,001 (0,001)	0,015 (0,029)
Green Ratio	-25,551 (15,169)	0,503** (0,158)	-0,583† (0,317)	13,84 (15,49)
CSR as Branding	-1,617 (9,022)	-0,167 (0,099)	0,451* (0,199)	-3,926 (9,213)
CSR as VP	-1,814 (8,467)	0,144 (0,095)	-0,341† (0,191)	13,191 (8,646)
Green Lease	2,838 (8,268)	0,133 (0,088)	-0,207 (0,176)	22,218* (8,443)
Investor Relations	-9,027 (8,181)	0,041 (0,085)	-0,132 (0,171)	-3,761 (8,355)
N	32	31	31	32
R <sup>2</sup>	0,147	0,465	0,393	0,328
F	0,59	2,854	2,125	1,676

Standard errors in parentheses.

†  $p < 0.1$ , \*  $p < 0.05$ , \*\*  $p < 0.01$

Solidity = Equity ratio

As is seen in the second model, *Green Ratio* is positively related to personnel intensity, which is the personnel costs divided by the turnover. Going green through certifying real estate thus seems to drive costs through increased personnel intensity, findings that corresponds to early discussions about the servitization paradox (Gebauer et al., 2005). Transforming the real estate from (mere) buildings to green buildings requires staff to handle not just the transition, but also the maintenance and up-keeping of a wide array of aspects other than the concrete building. The relation-

ship between the percentage green area and personnel intensity could thus signal a transition from being focused on owning buildings to providing real estate services.

A higher personnel intensity signals that the firm to a lower degree consist of real estate assets. The third regression model addresses this aspect through the *Real Estate Intensity*, measured as real estate assets divided by total assets. It can indicate whether real estate is the main (only) business of the firm. The strong negative effect from *Green Ratio* could be a sign that the firm needs to complement its real estate assets with other assets, but it could also be so that firms where the real estate is a minor part of the total business more easily can achieve a high degree of certification. CSR as part of a value proposition (*CSR as VP*) is also negatively related to *Real Estate Intensity*, which further supports the possible explanation that going green means moving away from traditional and pure ownership of buildings. Regarding *CSR as Branding*, this is positively related to *Real Estate Intensity*, which fits with the argumentation that a traditional view of real estate (as owning buildings) is more apt to emphasizing traditional marketing perspectives such as branding (i.e., maintaining the current institutions), whereas a value proposition orientation is closer to marketing through relationships (i.e., indicating that the firms are disrupting and creating institutions).

The fourth regression model shows that *Equity ratio* (Solidity) is related to the use of *Green Lease* in the communication to (potential) customers. *Equity ratio* shows financial strength as the investments are to a higher degree financed with equity rather than external debt (loans). But it also related to the firm's credibility. Financing the firm with internal resources can be a sign of long-term orientation and responsibility, which might go hand-in-hand with what the underlying intention of CSR-activities.

### 4.3. Financial Development and Commitment to Sustainability

Effects from CSR commitment were not clear in the financial status of the studied firms (see Table 7). Going through green certification of buildings, and other CSR activities, are however a process, and its effects might primarily be found in the development of the firm while going through the increased CSR commitment. This is tested in regression models seeking interference from the CSR variables on the relationship between the financial status in 2015 and the status in 2012. A strong connection is expected between variables such as turnover, employees and assets over time, and this can also be seen in the correlation table (see Appendix, highlighted correlations). If CSR commitment and activities affect the development of the firm, this is expected to show as significant effects from CSR-variables on the 2015-variable in the presence of the 2012-variable (a sort of mediation effect).

The first two models take interest in the development in fundamental representations of firm size: employees and turnover. Starting with employees, the strong relationship between the number of employees 2012 and the number of employees 2015 is nuanced with the impact from some of the CSR-variables. The 'Hard CSR approach' shows mixed effects as the number of certification projects negatively affects the development whereas the green certified area has a positive effect, i.e. increases the number of employees. A strong effect can also be seen from CSR as value proposition. All other factors considered, firms with a value proposition mindset have in average 61 more employees according to the model. This is in line with previous presented results regarding an increased personnel intensity, but the CSR value

proposition aspect here appears to be the main driver of an increase of employees. The turnover (in MSEK) is strongly related to the previous year's turnover, and an increase of around 18% is predicted by the model, all other factors constant. There is however a significant reduction in the turnover growth for firms offering Green Lease; amounting for a staggering 300 MSEK in average reduced turnover development.

**Table 7.** The effects of CSR activities on performance

Dependent Variable	Employees		Return on	Real Estate	Real Estate	Solidity 2015	Personnel
	2015	Turnover 2015	Assets 2015	Assets 2015	Intensity 2015		Intensity 2015
Intercept	2,17 (28,79)	-3,853 (140,356)	7,568 (6,682)	-1130,284 (9348,7)	0,375† (0,212)	4,647 (4,457)	-0,004 (0,024)
Projects	-2,538† (1,335)	-1,184 (6,512)	0,375 (0,301)	1,446 (436,871)	0,012 (0,009)	0,113 (0,193)	0 (0,001)
Certified Area	0,149† (0,081)	-0,312 (0,394)	-0,013 (0,018)	17,495 (26,924)	0 (0,001)	-0,009 (0,011)	0 (0)
Green Ratio	-21,624 (42,962)	31,52 (209,383)	-18,937† (9,744)	-13356,6 (14381,205)	-0,416 (0,275)	0,416 (6,049)	0,054 (0,042)
CSR as Branding	3,33 (27,066)	37,6 (132,005)	-2,251 (6,079)	7254,012 (8772,444)	0,383* (0,17)	-0,411 (3,765)	0,001 (0,024)
CSR as VP	60,836* (25,889)	101,12 (126,249)	-1,313 (5,828)	3730,329 (8434,943)	-0,235 (0,166)	3,388 (3,763)	0,013 (0,023)
Green Lease	-10,699 (24,599)	-302,906* (119,746)	-0,734 (5,404)	-7397,293 (8958,62)	-0,315† (0,154)	5,156 (3,685)	0,016 (0,021)
Investor Relations	32,479 (23,197)	91,37 (113,145)	-13,095* (5,265)	7097,788 (7694,887)	-0,011 (0,15)	-4,123 (3,187)	-0,011 (0,02)
Respective DV 2012	0,855** (0,001)	1,183** (0,002)	2,48** (0,407)	0,687† (0,34)	0,458** (0,145)	0,924** (0,08)	1,069** (0,052)
N	31	31	31	31	31	31	31
R <sup>2</sup>	1,000	1	0,683	0,683	0,581	0,911	0,973
F	124566	51739	5,938	5,926	3,816	28,116	99,457

Standard errors in parentheses.

†  $p < 0.1$ , \*  $p < 0.05$ , \*\*  $p < 0.01$

Solidity = Equity ratio

Looking at profitability, the model suggests a strong link between the *Return On Assets* from 2012-2015. The returns are however reduced by a high *Green Ratio*, again perhaps as a result of costly modifications and a change in value creation not captured by the ROA measure. Also, a focus on *Investor Relations* seems to reduce the development of returns. A possible cause for this could be that these firms to a higher degree divest the profit as returns to the shareholders, rather than re-investing in the firm. Another reason could be the short-term orientation that tend to come with a diverse ownership and being listed on a stock market.

No particular effect from CSR commitment can be seen in the development of *Real Estate Assets* from 2012 to 2015. The *Real Estate Intensity* does, however, show such effects. The effect from the *Real Estate Intensity* in 2012 is relatively weak, and in this context the positive effect from *CSR as Branding* and the negative effects from *Green Lease* appear strong. Just as in the previous regression models, emphasizing CSR in branding is related to a high asset focus on real estate, possibly indicating a strong business focus on buildings. The previous impact from CSR as value proposition (*CSR as VP*) is here in the shadow of *Green Lease*. Similar to value proposition, green leases require the firm to include more than the building in their business. This might be an indicator of the shift from traditional real estate business.

No significant effects from CSR commitment can be seen on the development of Equity ratio (*Solidity*) or Personnel Intensity when analyzed in this way, contrary to the findings reported earlier.

#### 4.4. The Sustainable Firms in Comparison to the Population

In short, the sustainable firms are more established than the population of real estate firms (see Table 8).

**Table 8.** Comparison between the certifying private landlords and the Swedish population of real estate firms

		N	Mean	Std. Deviation	Std. Error	ANOVA	
						F	Sig.
Firm Age	Pop.	34234	19,8	16,9	0,09	42,7	,000
	Sust.	34	38,8	29,2	5,01		
Employees 2015	Pop.	34026	5,29	216	1,17	735	,000
	Sust.	33	1594	8416	1465		
Turnover 2015 (MSEK)	Pop.	34026	18,7	474,5	2,6	1310	,000
	Sust.	33	5937	26440	4603		
Real Estate Assets 2015 (MSEK)	Pop.	34026	52,7	719	3,9	9210	,000
	Sust.	33	16895	23051	4013		
Total Assets 2015 (MSEK)	Pop.	34026	87	1033	5,6	9203	,000
	Sust.	33	22339	27459	4780		
Employee Growth 2012-2015 (%)	Pop.	33052	,276	127	0,70	5,19	,023
	Sust.	32	51,5	176	31,1		
Turnover Growth 2012-2015 (%)	Pop.	33052	272	8658	47,6	,016	,901
	Sust.	32	81,4	290	51,3		
Real Estate Assets Growth 2012-2015 (%)	Pop.	33052	85,4	2539	14,0	105	,000
	Sust.	32	4942	27794	4913		
Total Assets Growth 2012-2015 (%)	Pop.	33052	2162	64498	354,8	,034	,854
	Sust.	32	61,7	117,7	20,8		
ROA 2015	Pop.	34026	-9,11	2297	12,5	,001	,971
	Sust.	33	5,27	15,8	2,76		
Equity ratio 2015	Pop.	34026	-143	25553	138,53	,002	,968
	Sust.	33	32,8	18,2	3,17		
Real Estate Intensity 2015	Pop.	32835	,514	,386	0,002	7,36	,007
	Sust.	32	,700	,389	0,07		
Personnel Intensity 2015	Pop.	28769	,258	3,66	,022	,068	,795
	Sust.	32	,090	,207	,037		

Pop. = Population of real estate firms

Sust. = Firms holding green building certificates

They are in average twice as old and are many times larger. Significant size differences are found in regards to employees, turnover, total assets and real estate assets. Concerning the assets, real estate in average make up a larger proportion of the total assets in the sustainable firms compared to the population. The focal firms thus appear to be relatively focused on real estate. This is further indicated by their lower ratio of personnel costs vs. turnover, although the difference is not significant in the ANOVA-test.

Concerning growth, the comparison shows a mixed result. The sustainable firms have a weaker development 2012-2015 concerning turnover and total assets (both not significant in the ANOVA-test), but a stronger growth in employees and real estate (significant). Moreover, the sustainable firms show in average higher profit, represented by return on assets (ROA), and financial strength, represented by equity ratio, but both these differences are uncertain.

## 5. Conclusions

This ongoing study is a first attempt to explore the characteristics of firms that are early adopters of CSR within their industry stands out. It is furthermore an attempt to control if firms that does this as a genuine strategy ('green walk') stands out from those who do it as a branding issue ('green talk'). Thus, we have tried to capture if firms that leans towards a S-D logic mindset rather than traditional G-D logic mindset (Vargo & Lusch, 2016) stand out. Our early results offer some guidance.

First, our exploration of the Swedish real estate firms in comparison to the whole population of real estate firms indicates that there is an entry barrier. Thus, it is not the small and (presumably) flexible firms that are early adopters of CSR certificates but instead the old, large, and well developed firms that are seen in the frontline. We can expect several reasons for this. One is the mere cost; early adopters needs to be able to carry the extra costs for both the needed knowledge development (including hiring staff) as well as the cost for the certification process and fees. Another aspect that is harder to verify is the need to engage in institutional work which may delimit the possibility to have short return on investments. Thus, having a high engagement in CSR is a long-term strategy that is hard to financial justify when looking at a few years performance.

Second, our study did not find evidence of that having a S-D logic mindset would increase the financial performance. This result echo the result from studies that have captured the 'servitization paradox' in the manufacturing industry. Thus, reframing the real estate offering from being a 'space' (i.e., a similar thing as a 'goods') to a value proposition for value cocreation will according to our study reduce the return on asset but require more staff costs. However, our results indicate that we might have a too narrow view on value cocreation and its effects on the involved actors. Thus, our results require (a) further similar studies that combines capturing firms S-D logic aspirations in parallel with their de facto financial performance, but also (b) more conceptual discussions about which performance measures to use when measuring firms' performance in markets that are developing their CSR offerings so that they become an integrated part of the ongoing value cocreation.

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## Appendix

	Mean	StdDev	N	Green Building Projects	Certified Area (1000 m2)	Green Ratio (certified / total)	CSR as Branding	CSR as Value Proposition	Green Lease	Investor Relations	Employees 2015	Employees 2012	Turnover 2015 (MSEK)	Turnover 2012 (MSEK)	ROA 2015	ROA 2012	Real Estate Assets 2015 (MSEK)	Real Estate Assets 2012 (MSEK)	Real Estate Intensity 2015	Real Estate Intensity 2012	Solidity 2015	Solidity 2012	Personnel Intensity 2015	
Green Building Projects	17.47	29.62	34																					
Certified Area (1000 m <sup>2</sup> )	182.19	428.53	33	.87***																				
Green Ratio (certified / total)	0.24	0.27	33	.37*	.56***																			
CSR as Branding	0.71	0.46	34	.27	.21	-.19																		
CSR as Value Proposition	0.47	0.51	34	.46***	.33†	-.06	.61***																	
Green Lease	0.26	0.45	34	.31†	.38*	.12	.39*	.24																
Investor Relations	0.79	0.41	34	-.01	.09	-.08	-.01	.04	.14															
Employees 2015	1594	8416	33	.15	.13	.04	.12	.20	-.11	.09														
Employees 2012	1875	9990	32	.15	.13	.04	.12	.20	-.11	.09	1.0**													
Turnover 2015 (MSEK)	5937	26440	33	.18	.16	.05	.14	.22	-.09	.10	1.0**	1.0**												
Turnover 2012 (MSEK)	5102	22705	32	.19	.16	.05	.14	.22	-.09	.10	1.0**	1.0**	1.0**											
ROA 2015	5.27	15.83	33	.02	-.01	-.26	.09	.04	.09	-.12	.02	.02	.02	.02										
ROA 2012	5.57	6.33	32	-.07	.00	-.11	.13	-.10	.25	.16	-.02	-.02	-.02	-.02	.56***									
Real Estate Assets 2015 (MSEK)	16895	23051	33	.69***	.64***	.08	.42*	.48***	.34†	.31†	.11	-.07	-.07	-.07	.08	.02								
Real Estate Assets 2012 (MSEK)	10846	17562	32	.81***	.76***	.23	.36*	.46***	.58***	.26	-.09	-.09	-.05	-.04	.08	-.01	.77***							
Real Estate Intensity 2015	0.70	0.39	32	.09	.01	-.35†	.37*	.12	.04	-.04	-.32†	-.32†	-.30†	-.30†	.26	.01	.46***	.26						
Real Estate Intensity 2012	0.61	0.43	32	.13	.08	-.13	.22	.02	.35†	-.14	-.25	-.25	-.24	-.24	.23	.07	.17	.48**	.57**					
Solidity 2015	32.84	18.23	33	.10	.11	.16	.19	.27	.44*	-.10	-.08	-.08	-.08	-.07	.01	-.16	.17	.18	.02	.03				
Solidity 2012	31.69	18.43	32	.04	.11	.20	.13	.14	.42*	-.02	-.10	-.10	-.10	-.10	-.19	-.05	.14	.09	-.08	-.07	.91**			
Personnel Intensity 2015	0.09	0.21	32	-.09	-.02	.47**	-.31†	-.12	.01	-.05	-.08	-.08	-.10	-.10	-.35†	-.04	-.28	-.24	-.68**	-.52**	-.07	.14	.20	
Personnel Intensity 2012	0.08	0.19	32	-.10	-.03	.45*	-.35†	-.14	-.03	-.03	-.08	-.08	-.09	-.09	-.36*	-.07	-.29	-.23	-.70**	-.52**	.10	.16	.98**	

*†p<0.1, \*p<0.05, \*\*p<0.01* Correlations between variables 2012-2015 highlighted.

Solidity = Equity ratio

# DESIGN OF SERVICE SIMULATION EXPERIMENTS USING QFD

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*One of the aims of the designer is selecting appropriate factors for the determination of the simulation scenarios. The complete set of possible scenarios is huge and it's often useful to get subjective input to help screen out some vital factors. In this paper a Quality Function Deployment (QFD) matrix highlights controllable and noise factors to be considered when running a simulation experiment. It's assumed that interactions between the factors might be changed for each performance measure. The MSE criterion is utilized for selecting the vital service factors to be examined in the simulation experiments. The paper describes the implementation of the above methodology for customer order handling process.*

## 1. Introduction

Edvardsson (1996) distinguished three main types of development: the development of the service concept, the development of the service system (resource structure) and the development of the service process.

Goldstein et al. (2002) defined the service concept as the 'how' and the 'what' of service design that helps mediate between customer needs and an organisation's strategic intent.

Bullinger et al. (2003) define Service engineering as a technical discipline concerned with the systematic development and design of services using suitable models, methods and tools. In contrast with new service development, which is strictly marketing-oriented, service engineering adopts a more technical-methodological approach, attempting to efficiently utilize existing engineering know-how in the area of traditional product development to develop innovative services.

Seth and Deshmukh (2005) examined different service quality models reported in the literature. The authors concluded that customer expectations regarding particular services can be changed with respect to factors such as time, increase in the number of encounters with a particular service and competitive environment.

Cooil, Aksoy, Keiningham, and Maryott (2009) investigated how organizational climate is related to various business outcomes. The authors concluded that studies have generally examined outcomes separately or developed univariate measures that combine outcomes. They claim that these studies fail to (a) accommodate the multivariate character of important business results and (b) facilitate the firm's need to achieve success on several dimensions.

Kaner et al. (2011) proposed a methodology that allows designers to design simulation experiments through which they can handle various service factors and their in-

teractions in action and thereafter propose process improvements based on a generic analysis scheme. The methodology deals both with conceptual and detailed designs of service processes and enables the designer to define process factors schematically and simulate possible scenarios based on variations in these factors. The author presented the application of the methodology to the engineering of a customer order handling process.

One of the aims of the designer is selecting appropriate factors for the simulation experiment. Even if the simulation is very fast, the complete set of possible scenarios is huge and it's problematic to run all possible scenarios. When faced with many factors, it is often useful to get subjective input to help screen out some vital factors. In this paper a Quality Function Deployment (QFD) matrix highlights factors and interactions to be changed when running a simulation experiment for a service system.

Quality function deployment (QFD) is a method for structured product planning and development that enables a development team to clearly specify a customer's wants and needs, and then to systematically evaluate each proposed product or service capability in terms of its impact on meeting these needs (Cohen, 1995). The QFD process involves constructing one or more matrices. The first of these matrices is called the House of Quality (HOQ). The HOQ maps the WHATs representing desired customer product attributes (the customer's voice) into the HOWs – that is, technical characteristics as viewed by the development team.

Dror and Sukenik (2011) described the development of a strategic service framework from a global perspective of the important components of the service system at different hierarchical levels. A QFD method was used for applying the strategic global service framework to an individual organisation. The methodology supported, by the mean square error (MSE) criterion, reveals the unique service quality model suited to individual organisations.

The methodology proposed herein—the House of Service System (HOSS) methodology—uses a generic QFD based framework to organize service decision making and streamline the process. The QFD technique is well-known for creating a linkage between product design, customer needs and process requirements and is extended here for methodology needs. The methodology provides the client and the owner of the system with an objective assessment of potential improvement that enable him or her to construct an improvement profile. Based on the improvement profile, the service engineer can propose optional service systems. The MSE criterion procedure is implemented to divide the set of service components into a group of dominant vital components and a complementary group of less important items. The methodology implementation is demonstrated by a detailed example of a customer order handling process.

## **2. House of Service System (HOSS)**

Leading companies around the world have been using QFD since 1966. Its two-fold purpose is to assure that true customer needs are properly deployed throughout the design, building and delivery of a new product, and to improve the product development process itself (Akao and Mazur, 2003). Typically, the approach is

described in terms of a four-phase model consisting of four successive stages or matrices: (1) an overall customer requirement planning matrix (also called the HOQ); (2) a final product characteristic deployment matrix; (3) a process plan and quality control charts; and (4) operating instructions. An HOQ maps the WHATs representing desired customer product attributes define VOC Voice of Customer (VOC) into the HOWs, the technical characteristics as viewed by the R&D staff; see (Chan, 2002) for an extensive review of the QFD literature.

This paper builds on the HOQ framework by developing a House of Service System (HOSS) that translates the service needs of an enterprise into the relative importance of the components of its service system according to their relative importance in meeting these needs.

The general building sequence of the HOSS comprises the following six major steps:

1. *Performance measures (WHATs)* – The performance measures that can be evaluated using simulation experiments, can be divided into categories: *Efficiency and Quality*. *Efficiency* – these performance measures relate to producing results with little wasted effort. Kaner et al. (2011) refer to throughput time, cost and resource utilisation of the whole system and of its parts. *Quality* – These performance measures relate to a service level usually evaluated in a given time frame.
2. *Importance and capability gap of the performance measures* – Assign assessments observed from service surveys; include the importance and capability gap when a performance doesn't obtain its target .
3. *System components (HOWs)* – Select a structured set of relevant system components (the ceiling), i.e. as a consequence of fitting service concept components into the simulation model settings. Kaner et al. (2011) distinguished four types of factors: (1) Customers – benefit from the service process; (2) Inputs – trigger the service process execution or describe the initial status of the service before process execution; (3) Resources – enable service execution; (4) Processes – describe the dynamic and static attributes of the inputs' transformations into services.
4. *Interrelationship matrix* – Evaluate the relationship strength between each performance measure and each service component (the house's main contents). An appropriate scale is applied, illustrated by symbols.
5. *Synergy/tradeoff between the system components (the roof)* – For each performance measure, identify which system component supports (or obstructs) another system component. These synergies can highlight innovation opportunities or bring to the fore areas that need reorganization.
6. *System priorities* – Calculate the system component priorities.

Dror and Barad (2006) utilized the MSE criterion as a quantitative tool for implementing the Pareto Principle. This principle was presented by Juran as a universal principle he referred to as the "vital few and trivial many". Dror (21010) showed that the one-way ANOVA tools, i.e., MSE, MSB and the F-statistic, are equivalent when used for dividing a group of ordered items into two groups: the vital few and the trivial many. The ANOVA method is utilized here for selecting the vital factors for the determination of the simulation scenarios.

### 3. Example: Constructing the HOSS for customer order handling process

Kaner et al. provide a case description of a service system: The goal of the system is to supply ordered and available goods to a customer whose credit (or payment ability) is approved. The sales clerk receives and records the customer's order. The account manager confirms the customer's payment ability and authorises the sale. A warehouse worker then checks the availability of the item. At this point the order reverts back to the sales clerk for his/her continued handling. The sales clerk determines the status of the order: If the item is not in the stock or the customer's payment ability is not approved, the sales clerk will close the order. Otherwise, he bills the customer and the warehouse worker delivers the product to the customer and updates the warehouse's inventory status. Only an expert warehouse worker is authorised to do the updating. Since one factor in the above scenario relates to the possible mode of execution (parallel or sequential execution of stock availability checking and customer payment ability approval), two processes are possible

#### 3.1. The relevant performance measures (WHATs)

According to our methodology, we first determine the performance measures. Based on the data given, we decided to focus on the means of average customer throughput time, resource utilization, and service level.

#### 3.2. The importance and capability gap of the performance measures

In the second step of building the HOSS (right wall), scores, based on security surveys, were assigned by experts who assessed the importance and capability gap of every performance measure. In order to emphasize the dramatic character of reducing in the system performance, the geometrical and not arithmetical scale of scores was used according to:

- *Performance importance*: unlikely/weak – 1, likely/medium – 3, very likely/strong – 9
- *Capability gap*: light – 1, medium – 3, high – 9

#### 3.3. The System Components (HOWs)

The relevant service system “*hows*” (components) include:

Control factor:

- Sales capacity
- Warehouse flexibility
- Process structure
- Waiting line policy
- Customer type

Noise factors:

- Customer credit percentage



- Customer arrival rate
- Customer involvement - abandoning the queue

### 3.4. The Interrelationship Matrix

This stage of constructing the HOSS is very essential. 3 what's (rows) and 8 how's (columns) form 24 cross cells ( $I=3$ ,  $J=8$  and  $IJ=24$ ). Each cell contains the assessment of the extent to which the specific how might improve a corresponding performance measure (what), as is customary in QFD, on the basis of four degrees of interaction: high interaction (=9), medium interaction (=3), low interaction (=1) and no interaction (= blank, further considered as zero). This assessment is usually based on experts' knowledge and experience. Consensus decision making based on the Delphi method (Linstone; Turoff 1975) was selected as the most appropriate for arriving at the final scores.

### 3.5. The Interrelationship Matrix Synergy/tradeoff between the system components (the roof)

The HOSS roof construction here differs somewhat from the usual QFD technique. In the context of this paper synergy/tradeoff means that two hows functioning together produce a combined result not independently obtainable. Positive or negative synergy can exist. The latter often appears as a result of tradeoff between two hows. Positive synergy occurs if interactions between two hows produce a joint effect, which is greater than the sum of the parts acting alone. In contrast to standard QFD, the presence of positive/negative synergy must be analyzed for each performance measure separately (Dror et al. 2012).

For example, trade of between sales capacity and customer arrival rate - system utilization is the ratio of arrival rate to service capacity. The lack of agility in service firms to change their capacity to follow the demand fluctuation is a major cause of the negative impact on increased capacity utilization and on decreased service level and throughput time.

### 3.6. System components priorities

A simple Excel© function, such as SUMPRODUCT (array1, array2, array3) can be used for this purpose. The ANOVA based MSE method described above, when applied to these data, emphasize the following five components as dominant for the hotel service system: sales capacity, warehouse flexibility, process structure, customer credit percentage, and customer arrival rate.

## 4. Conclusions

QFD, is a product-oriented quality technique supported by (ANOVA), a statistical technique, was applied in an innovative way to reveal the requirements of the service system to be adopted by an individual organization or the suitability of a service system already in place. The method provides useful information and understanding regarding the relative importance the management of an enterprise should attribute to its service system components as dictated by performance measures as well as by its internal capabilities. QFD provides a mechanism for leveraging the service system of an individual organization. The HOSS highlights potential improvement in performance measures and translates them into the relative importance of the service system components.

The HOSS method is different from the classic QFD. In the classic QFD, a single roof presents correlations between the technical characteristics. In HOS we assume that correlations between the system components might be changed for each scenario, i.e., several roofs, corresponding to the number of rows in the HOS matrix. Analysis of Variance (ANOVA), supports pinpointing of the vital service system components. It divides a group of items (here a set of service system components) into two groups: vital few and trivial many.

A QFD matrix is typically carried out by teams of multidisciplinary representatives from all stages of product development and manufacturing. For building the HOSS, a cross functional team is established. It might include service experts, managers, technical engineers and maintenance technicians. Among its assignments, the team would be tasked with organizing the process of extracting input information for the HOSS matrix.

This paper describes the implementation of the above methodology for customer order handling process. The QFD team identifies the most common kinds of performance measures (customer throughput time, resource utilization, and service level) and components of the service system (control factors: sales capacity, warehouse flexibility, process structure, waiting line policy, customer type. Noise factors: customer credit percentage, customer arrival rate, and customer involvement).

The HOSS supported by the ANOVA method pointed out five vital components of the service system: sales capacity, warehouse flexibility, process structure, customer credit percentage, and customer arrival rate.

The method applied in this work effectively supports the selection of vital service system components to be improved. It emphasizes adopting a systemic approach for selecting the vital service system components in response to the required improvement levels of the performance measures.

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# DETERMINANTS OF CITIES AND TOWNS SPENDING ON CULTURE. ANALYSIS FOR POLAND

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*Culture takes an important part in the urban and regional development and growth. My study presents that Polish towns and cities spending on culture is determined by the socioeconomic characteristic of local society. This is expression of preference matching argument for decentralization. I found also that the important determinant of local spending on culture are limits in fiscal autonomy of sub-sovereign budgets. Especially the level of spending autonomy strongly differentiate the size of local spending on culture. Therefore the solution to the problem of unequal access to cultural services is no grant or regulation which force local governments to do something, but more autonomous budgets on revenue and expenditure side.*

## 1. Introduction

Culture takes an important part in the urban and regional development and growth. (Bille & Schulze, 2006) This is one of the arguments for public support to the cultural sector. In Poland public tasks for culture are deeply decentralized, about 70% of public spending on culture goes from sub-sovereign budgets. Local governments are responsible for organization and financing of public cultural entities and they also support private cultural institutions. Spending on culture is a small, but steadily growing part of local budgets (in average about 3%) but there is important variation in this spending. There are cities where this spending decides about less than 0,5% of their budgets and those which spend on culture more than 10%. Those differences are also dramatic in monetary terms. The first explanation of this variation could be so-called preference matching- or allocative efficiency- idea. One of the main arguments for decentralization is that local public spending is in line with local citizens preferences. There is a second, and less positive explanation of this variation. It needs to be noticed that decentralization create inequalities, related to the differences in cities budgets or more generally the degree of real local autonomy. This is the core and the

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unsolved problem of fiscal decentralization policy, because, on one hand, the unequal revenue base create the necessity to established equalizing transfers in local budgets, on the other hand, such transfers decrease autonomy of municipalities and erode the efficiency of local governments. What's more, previous studies presented that decentralization not only reveals local inequalities but also deepen them. The aim of my study is to find determinants of variation of Polish cities and towns spending on culture. I analyze if those spending are matched to citizens preferences and I try to answer if and how differences in degree of local autonomy influence the cities spending decisions on culture.

In the first part of my paper, I make a short overview of the literature on determinants of local government spending, with a special focus on decentralized spending for cultural services. In the second part, I present basic information on local governments finance and organization in Poland. I introduce indicators of expenditure and revenue autonomy for Polish municipalities. In that part, I present also regulations, structure, and size of towns and cities spending related to culture. In last part using econometric panel data analysis for Polish cities and towns in years 2000-2014 I present the impact of restrictions on the spending and revenue autonomy on local government expenditures on culture<sup>2</sup>.

## **2. Determinants of local governments spending policy. Review of literature**

One of the main arguments for decentralization is that local public spending is in line with local citizens preferences. This argument - known as preference matching idea or allocative efficiency in local government - is the theme of very important for local finance theoretical and empirical investigations. The theoretical base for this argument was established by Tiebout and Oates. Tiebout in his seminal paper presented that at local level citizens could "vote with their feet" and choose those local units where cost/benefits composition is the best for them. Local governments compete for citizens and produce what they really want. (Tiebout, 1956) Oates presented, that centralized production of local public goods creates the loss of wealth, and only local units could produce local public goods at proper - expected by local citizens level. (Oates, 1972)

In the empirical studies, the question of allocative efficiency is analyzed using demand system framework. The classical assumption is based on the median voter model. (Downs, 1957) In terms of independent local governments, the "median voter" decides on the expenditure made locally. (Bergstrom & Goodman, 1973; Borchering & Deacon, 1972). The idea of median voter model was the theme of many theoretical and empirical studies, which presents that assumptions of this model are far from reality. (the interesting discussion was presented by Bailey, 1999; Holcombe, 1989) Despite that, the basic idea of a correlation between the voter's preferences measured by socio-economic characteristics of local citizens is still present in empirical analysis on local government expenditures. Those studies analyzed usually local

<sup>2</sup> The similar study for rural municipalities I presented in Kopańska (2017)

governments in one country, and study the determinants of the variation in spending per capita for analyzed good or services using the linear relation:

$E_i = f(\text{soci}_i, \text{cost}_i, \text{fin}_i)$ ; where

$E_i$ - expenditures per capita for analyzed good of  $i$ 's municipality

$\text{soci}_i$ - the vector of a characteristic of a local society in municipality  $i$

$\text{cost}_i$ - the vector of characteristics of  $i$ ' municipality which explain the variation of costs of local production

$\text{fin}_i$ - municipality  $i$  financial condition,

The private income of citizens, as a budget constraint for their demand for public spending and tax as a price for local public goods, is usually ignored in those studies. The idea is that taking into account fiscal illusion, and the characteristic of the local systems in many countries, where local tax policy is very limited, it can be assumed that local and private goods are not substitutes for one another and voters maximize their utility only with respect to local goods. (Borge & Rattsø, 1995) The important is local government income, divided on own and other categories of incomes- which is related to so called fly paper effect of grants (Inman, 2008) The prices for local public goods do not exist, but important is the variation of costs of public production in different municipalities.

It needs to be noticed, that the allocative efficiency means that public spending varies among municipalities. If such variation is the result only of preference matching it can be positively assessed. But the variation of the level of public spending in different municipalities is related also to the differences of revenue base of local units. As Sole-Olle noticed: "decentralization has the potential for better matching of regional preferences, but this potential would not be realized in practice if the revenues at the disposal of some regions are severely constrained" (Solé-Ollé, 2009) This is the core and the unsolved problem of fiscal decentralization policy, because, on one hand, the unequal revenue base create the necessity to established equalizing transfers in local budgets, on the other hand, such transfers decrease autonomy of municipalities and erode the efficiency of local governments. What's more, previous studies presented that decentralization not only reveals local inequalities but also deepen them. (Lessmann, 2009; Persson & Tabellini, 1996; Prud'homme, 1995; Zhang, 2006) and in the case of culture, such result could be found for example in (Urrutiaguer, 2005) The question about acceptable differences of public spending remains open (see discussion in Hagan, 1996) but the problem of inequalities need to be taken into account in studies on decentralization.

The large literature used demand framework in studies on spending for education (Ahlin & Mörk, 2008; Borge & Rattsø, 1995; Poterba, 1996; Salinas & Solé Ollé, 2009) public investment or the structure of public spending (Borge & Brueckner, 2014; Busemeyer, 2008; Faguet, 2004; Kappeler, Solé-Ollé, Stephan, & Valila, 2013) There are also some studies where demand system framework is used to analyse municipal spending on culture (Benito, Bastida, & Vicente, 2013; Depalo & Fedeli, 2011; Hakonsen & Loyland, 2016), but taking into account the small size of spending for culture in local budgets such analysis are relatively rare and according to my knowledge there are no such studies for Poland and other East European countries .

Below I shortly discuss the most important factors which were presented as important determinants of local spending on culture.

## **2.1. Socio-economic characteristic of local society, as an determinant of local spending on culture**

Young people- children and youth- are important consumers of the local cultural offer. This is due to parents perception of the value of cultural heritage. On the other hand, parents have less time to take part in cultural activities, and there are also other spending related to kids, which are important in public budgets (especially education). That is why the influence of the share of young people on cultural spending is unclear. The second important group of society analyzed in cultural studies is old people. They have time to take part in cultural events and studies present that municipalities, where the share of the elderly population is higher, spend more on culture. (Benito et al., 2013; Borge & Rattsø, 1995; Getzner, 2004; Werck, Heyndels, & Geys, 2008)

The literature presents, that women pay more attention for cultural heritage, they also are more interested in the wealth of future generations Women tend to consume more cultural goods and services than male. (Diniz & Machado, 2011; Muniz, Rodriguez, & Suarez, 2014) That is why we could expect higher public spending in municipalities where there are fewer men.

As mentioned private income is ignored as a budget constraint for demand for publicly provided goods. But we could use information about citizens income as an information needed to understand their preferences. According to Wagner's law- private income increases causes an increase in public spending (even higher than in private spending). Culture is sometimes defined as luxury good, so in the analysis of private demand for culture was found positive income elasticity of demand for culture but in the case of low-income people it could be a crowd out by spending on more basic goods and it is not purchased at all below a certain level of income. While in the case of high-income citizens the interest in publicly sponsored culture could be a crowded out by private cultural goods. Taking those opposite arguments into account the influence of citizens income on their preferences on public spending for culture is unclear. In most studies, it was found positive income elasticity (Benito et al., 2013; Getzner, 2004) but (Werck et al., 2008) did not find any significant correlation, while (Rose & Schultze, 1998) presented the negative impact of private income on support public spending for culture.

The level of education is positively related to income. So we could suspect the similar effect of higher education on public spending. It needs to be noticed also that higher education makes culture more accessible. Highly educated people enjoy culture more, first because they understand it better, second because culture is positively adjective (the satisfaction is rising with consumption) and those people have more experience with culture goods. (Rose & Schultze, 1998) The positive impact of the higher education on public spending was found in (Getzner, 2004) But in many studies, the level of citizens education was found as not significant explanatory of their support of public spending for culture. (Benito et al., 2013; Werck et al., 2008)

## 2.2. Characteristic of the local cultural sector

The second groups of variables, which is needed to understand variation in local spending for culture, are related to the differences in local cost of cultural services. The important is the size of the local population. In many studies the size of the population was presented as demand factor- more populated municipalities have a central role in relation to cultural public goods. (Benito et al., 2013; Muniz et al., 2014). But it is also correlated to cost of cultural services. If there are more people who use cultural services, the cultural infrastructure (for example houses of culture, museums, concert halls) is more complicated and costly. (Rose & Schultze, 1998; Werck et al., 2008) That is why some authors expect that per capita spending for culture increase with a number of citizens. But we could expect also the economies of scale, and when the population exceeds a certain level, the per capita spending will decrease.

Population density is the second factor where demand and cost aspects are correlated. In less populated municipalities, the problem of distance to central places of the local unit may decrease the citizens demand on culture. Simultaneously in more populated municipalities, the economies of scale occur and cost and spending per capita are smaller. (Benito et al., 2013; Werck et al., 2008)

The cost of culture services is related also to a number of infrastructure objects needed for culture services. That relation is well developed in case of analysis of education- where a number of schools is presented as an important factor of spending for education. For example- (Ahlin & Mörk, 2008; Borge & Rattsø, 1995; Falch, Ronning, & Strom, 2008; Poterba, 1996; Salinas & Solé Ollé, 2009) In previous studies on local spending on culture these variables were not analysed, but taking into account they economic validity I add variables of the quantity of cultural objects and users in my empirical analysis.

## 2.3. Local government's financial statement and its influence on local spending

The studies on local governments spending policy, present that important determinant of the level of spending is the size of the municipal budget. Higher local income means more money for all categories of spending. (Benito et al., 2013; Werck et al., 2008) But in the case of local governments spending, we need to take into account not only size of local incomes, but also the real autonomy of local budget policy. Mentioned earlier Oates' and Tiebout's' models are based on the assumption of complete fiscal autonomy of local governments. In those models, local governments solely decide about the size and structure of local spending and finance these spending by own local taxes levied on local citizens. Unfortunately, in practice such totally decentralized system does not exist.

It is associated with the following problems in the shaping of revenues and tasks of local governments (Oates, 1999; Swianiewicz, 2011)



- constraints and territorial diversity of the local tax base, which leads to significant disparities among local governments and therefore requires adjustment in accordance with the redistributive function of the state,
- need for stabilization policy tools to be held in the hands of the government,
- big scale of public tasks the production of which is local in nature but the results go beyond the local government (e.g. implementation of the tasks related to education, health care, environmental protection).

The existence of the problems requires the State's intervention – and, therefore, limiting the decentralization by:

- additional financing of local budgets by general grants and of specific tasks by categorical grants,
- the introduction of orders as to the quantity and quality of the goods supplied by local governments,
- determining the desired level of revenue and expenditure,
- limiting the freedom of local governments in shaping local taxes.

Limitation of decentralization affects the autonomy of the policy of local governments, which therefore affects the results of decentralization. There are many studies which present that grants influence on public spending more than own local taxes. This effect is called fly-paper effect and was presented in plenty of studies. (Inman, 2008) In the case of spending for culture, the fly paper effect of grants was presented in Hakonsen & Loyland study for Norway (Hakonsen & Loyland, 2016). There are also studies where the revenue autonomy is measured –as the share of local taxes or own local revenues in total local revenues. It is presented that less revenue autonomous units tend to over- spend and over- debt. (De Mello, 2000; Weingast, Shepsle, & Johnsen, 1981) But the studies on the influence of spending autonomy on local decisions are rare. Usually, as spending autonomy indicators are used shares of un-granted expenditures to all local spending. But as presented above, not only grants affect spending autonomy, there are also different regulations which determine the quantity and quality of locally supplied goods. To established spending autonomy indicators the detailed analysis of these regulations is needed. (Bach, Blöchliger, & Wallau, 2009; Martinez-Vazquez & Timofeev, 2009; Oulasvirta & Turala, 2009) I did such analysis for Polish local governments using the concept presented by Bach at all (2009) I distinguished not- and low-autonomous spending, and proposed indicators of spending decentralization:

$ISA = (OE - N\&LA)/OE$ ; where

OE = operational expenditure

N&LA = not- and low-autonomous expenditure

As not autonomous spending I define those which are financed by specific grants and some categories of obligatory spending (for example related to reversed grant). As low autonomous, I defined spending which is not financed by grants, but the regulations strictly define the budgetary obligations (and budget autonomy is very limited)

It is worth to be mentioned, that regulations which define some spending as not- or low- autonomous are the same for every municipality. But in reality, the share of unrestricted local spending is different in different local units due to the variation of local own revenues but also the costs and local needs related to regulated expenditures. That is why we could distinguish de-jure local autonomy, which is equal for all local units, and de-facto local spending autonomy – which differ towns. That real differentiation is the basis of our analysis. The less autonomous local units have less money for other than obligatory spending. As presented by Hakonsen & Loyland (2006) “greater regulation and standardization of welfare services lead to negative effects for the cultural sectors in the municipalities”. It seems to be a logical consequence of the restrictions in public budgets, but there is an open question about the possibility of reaching allocative efficiency in case of less autonomous budgets. In other words, it is a question about the interaction between the level of autonomy and local citizens demand for culture. I will try to answer it in my empirical study.

### 3. Local government in Poland

The decentralization reforms were part of transformation and decommunization process in Poland. The municipalities (gminas) as independent local units was established in 1990 and it was one of the firsts reforms undertaken by new, Solidarity governments. In 1999, due to the second phase of decentralization reform, the upper levels of sub-sovereign governments (powiats and voivodships-regions) were set up.

Sub-central governments in Poland are responsible for important part of public tasks. Gminas tasks, are defined by law very broadly- all local tasks, which are not given to other units, and there are also enumerated list of more than 20 obligatory tasks related to social (like education, culture, healthcare) and communal services (like water supply, roads, and transport), and also local development. Powiats, are the “middle” level, and they are responsible for services at “above then gminas” characteristic, the list of tasks given by law is closed- there are 22 services, among them the most important are related to education, transport, and social care. The most important task of regions is regional development and the most important expenditures are related to transport. Local and regional expenditures represent about 30% of public spending. The most important are expenditures of 2412 municipalities and 66 big cities, which operate as gmina and powiat. We can distinguish three types of gminas rural, urban and mixed municipalities. In my study, I focus on urban municipalities (239 units) and big cities. Those units, as natural centres of regional or local areas, are especially important in the case of analysis on public spending on culture. (Werck et al., 2008)

Local governments in Poland have four basic categories of revenues: own revenues, shared-taxes, conditional grants, non-conditional fiscal transfers (subwencja). Conditional grants decide about (in average) 14% of revenues in towns and 11% in cities. Most of these grants are related to social protection services. The share of general grant in local revenues is about 25% in cities and 21% in towns. The most important part of the general grant is educational subvention, which is calculated according to a number of so-called “calculated” pupils and teachers in schools. But as a general grant, it could be used by local governments for any local purposes. In practice, local

governments spend much more on education, then receive from educational subvention (in average it covers about 50-60% of towns and cities spending on education). The important part of towns and cities revenues are shared PIT and CIT. Every local unit receives about 39% PIT of taxes levied on their citizens and 6,7% of CIT levied on firms from its territory. Big cities receive also the poviat's part of shares, it is additionally 10,25% of PIT and 1,4 of PIT. According to Polish law, these shares are defined as own local taxes (the tax base is local), but local units do not have any fiscal power related to them. Those shares decide about 22% of local revenues.

Own revenues include own taxes (real estate, agricultural, forestry, small businesses) income from user fees and charges, from the sale or rental of municipal property. Gminas, have the right to impose own taxes, however, the Ministry of Finance determines both the base and maximum rates of these taxes. As in other studies, the share of own revenues in local budgets I define as revenue autonomy:

$IRA = OR/R$ ; where

OR = own local revenues and the loss of revenues due to local fiscal policy

R = all budget revenues and the loss of revenues due to local fiscal policy.

Below in the table 1 are presented the basic statistics of IRA.

**Table 1** Differentiation of revenue autonomy (IRA) of cities and towns. Data for 2014.

	mean	p50	min	max	cv
big cities	0.41	0.41	0.28	0.64	0.18
towns	0.44	0.43	0.25	0.89	0.20
Total	0.43	0.42	0.25	0.89	0.20

Source: own calculation based on budgetary data

The revenue and spending autonomy are correlated, the Pearson coefficient of correlation is 66% in cities and 57% in towns. It is worth to add that differentiation of both of these indicators has the specific geographical characteristic. The diversity of local economy is related to the history of Poland. In XIX century Poland was occupied by 3 neighbouring countries and the differences in regional development, but also social and cultural characteristic of citizens of these regions are still present. (see for example (Gorzela & Jałowiecki, 2001).

As presented above local governments are responsible for important part of public tasks. Among them are welfare services- education and social assistance. They decide about 50% of local budgets. Those two services, as in other countries are strongly regulated. (Bach et al., 2009; Kvalsund, 2009; Tranvik & Fimreite, 2006) In the case of social assistance, there are specific grants for tasks commissioned by central government (like poor or unemployment benefits). There are also tasks defined as own local responsibilities (and not financed by specific grants) but where are given strict instructions related to the type and size of assistance. In the case of education, there are no specific grants, but the most important part of these spending- teachers' salaries and more generally the rules related to teachers employment are defined by special law. In the case of education, there are also defined some obliga-

tory payments- for non-public schools and kindergartens. The other parts of educational spending- like schools' maintenance, materials and equipment's for schools are not defined in law. Taking above into account I established spending autonomy indicators for Polish towns and cities. In addition to the above-mentioned categories of non-autonomous education and social assistance expenditure, other spending financed by conditional grants and obligatory contributions to the state budget were included. But those other categories of expenditures are only very small part of local budgets. Table 2 presents the basic statistics of spending autonomy indicator (ISA) for Polish towns and cities.

It needs to be noticed, that proposed by me indicators defined un-autonomous spending and revenues very cautiously. Among own local revenues, there are taxes where the local fiscal power is very limited. The other than analyzed spending are also quite strictly defined by law. But I take into account the most important parts of local budgets so even when the size of local autonomy is in reality even smaller than defining by proposed indicators, the variation of the autonomy among towns and cities is properly presented. That variation gives me the possibility to find the answer how differences in local financial condition influence their spending on culture.

**Table 2** Differentiation of spending autonomy (ISA) of cities and towns. Data for 2014.

	mean	p50	min	max	cv
big cities	0.54	0.54	0.38	0.75	0.14
towns	0.50	0.50	0.35	0.75	0.14
Total	0.51	0.51	0.35	0.75	0.15

Source: own calculation based on budgetary data

Culture is only small part of towns and cities expenditures. Spending on culture is a small, but steadily growing part of local budgets (in average about 3%) but there is important variation in this spending. There are cities where this spending decides about less than 0,5% of their budgets and those which spend on culture more than 10%. Those differences are also dramatic in monetary terms, in table 3 the information about towns and cities spending per capita on culture are presented.

In contrast to tasks related to education and social welfare, the spending for culture could be defined as autonomic local tasks. Towns and cities establish and finance cultural institutions- libraries, the house of culture, museums, theatres, cinemas or orchestras, choirs etc. They are also responsible for the protection of historical monuments. Sub-sovereign governments finance also non-public cultural institutions. The decision related to organization and financing of the cultural sector is only broadly defined by law. The only expectations are libraries- according to the law in every municipality need to be at least one library. There are also rules which define the legal form of public cultural institutions and rules related to their financial planning, but (except the rule of the obligatory library) without any detailed specifications to the quantity or quality of cultural offer or rules related to employment. The grants to private institutions are awarded according to general rules related to public finance. It needs to be noticed that public and private cultural institutions could receive money also from other public and private units, they also could establish charges for the access – so

could partly cover the costs of their activity. In my analysis I look only at towns and cities budgets, so part of mentioned above financial flows related to cultural institutions which are at the territory of towns or cities is not visible in my study. But those other than sub-sovereign grants decide only about the app. 17% of revenues of cultural institutions. (Kukołowicz, Modzelewska, Siechowicz, & Wiśniewska, 2016; Malinowska-Misiąg, 2016)

**Table 3** Differentiation of per capita spending on culture in years 2000-2014. (in real terms)

year	CITIES					TOWNS				
	mean	p50	min	max	cv	mean	p50	min	max	cv
2000	75.9	71.2	33.9	147.5	0.35	63.4	57.2	8.2	304.3	0.51
2001	78.0	72.4	37.1	212.4	0.39	62.6	57.8	7.2	305.2	0.48
2002	77.6	71.7	22.3	219.3	0.43	64.1	59.3	12.1	297.4	0.48
2003	79.6	73.2	34.1	215.2	0.40	65.9	61.0	15.3	264.5	0.44
2004	82.3	78.3	35.5	208.2	0.41	67.1	59.8	10.9	302.3	0.47
2005	85.5	80.2	38.6	198.5	0.41	71.9	66.2	11.5	311.4	0.46
2006	92.8	85.1	43.0	234.0	0.41	77.2	72.2	15.8	307.3	0.48
2007	99.9	94.6	44.4	225.4	0.37	82.4	76.9	16.0	278.5	0.44
2008	110.4	101.0	53.0	267.5	0.39	91.5	85.9	17.4	426.7	0.48
2009	115.8	108.1	52.3	291.1	0.40	97.8	92.3	18.1	446.3	0.47
2010	117.5	106.6	48.4	310.2	0.39	99.7	90.1	23.9	417.3	0.49
2011	115.7	108.4	44.5	339.3	0.41	93.6	87.2	16.3	387.6	0.47
2012	114.4	110.0	45.5	346.7	0.41	93.9	85.9	17.3	396.6	0.49
2013	114.1	108.1	45.9	373.6	0.43	95.4	87.9	20.0	406.0	0.47
2014	122.7	117.0	57.0	359.4	0.41	102.2	92.5	29.1	420.4	0.46

Source: own calculation based on budgetary data

In next part of this paper, I will try to find determinants of variation of Polish cities and towns spending on culture.

#### 4. The determinants of towns and cities spending on culture. An empirical analysis.

To find the determinants of towns and cities spending policy for the culture I made econometric panel analysis for 304 units in years 2000-2014. I used dynamic panel estimator – system GMM, which well suit to budgetary analysis (Heinesen, 2004;

Zhu, 2013). First I do the simple demand framework model<sup>3</sup>- as presented in first part of this paper. The analyzed equation is:

$$E_{it} = \alpha E_{i(t-1)} + \sum_k \beta_k soc_{it} + \sum_m \delta_m cost_{it} + \sum_n \gamma_n fin_{it} + \theta T + \varepsilon_{it}$$

Where

$E_{it}$ - per capita spending for culture of town or city  $i$  in year  $t$

$E_{i(t-1)}$ - lagged value of per capita spending for culture

$soc_{it}$ - socioeconomic characteristic of town or city  $i$  in year  $t$

$cost_{it}$ - cost factors of culture in town or city  $i$  in year  $t$

$fin_{it}$ - financial factors of town or city  $i$  in year  $t$

$T$ - dummy variables equal 1 in year  $t$  and 0 in others

$\varepsilon_{it}$ - error term;  $\varepsilon_{it} = \vartheta_i + e_{it}$ ;  $\vartheta_i$ -town/city specific effect,  $e_{it}$ - observation specific errors

$\alpha, \beta_k, \delta_m, \gamma_n$ - sought coefficients

Table 4 summarizes the variables which I use in analysis. In this table are also presented results of the analysis. (for clarity of presentation in table 4 I do not present variables for years).

The financial factors were significant in both models. The most important explanatory of spending for culture in year  $t$  is the local unit's spending in a previous year. The revenues of local units are also an important determinant of the size of local spending for culture. 1% increase of local revenues per capita increase local spending by 0,11-0,12%. Two other revenue categories – grants and own city or town revenues from cultural services are significant, the coefficients are small but those revenues are analyzed in the model in per capita – not- logarithmized values. Grants for culture or own revenues are not a regular part of local budgets, so there are zeros in the database and we could not logarithmize them. 1 zloty more revenues from grants per capita cause 0,1%-0,2% increase of local spending for culture, while 1 zł more own revenues from culture per capita in previous year cause decrease of public spending by 0,04%-0,03%. In budgetary data, I analyzed also the relation between local investment in culture and the size of operational public spending for culture. The relation is significant and positive. The 1zł more spending in a previous year results in

<sup>3</sup> All analysis were done in STATSE14

0,03% increase of local spending for culture. This means that investments are related to the development of the cultural offer and not to the cost savings

**Table 4** List of variables and estimation results for demand model for logarithm of spending on culture per capita (E) in years 2000-2014

Variable:		Description of the variable:		
L.E	Financial variables	Logarithm of spending for culture per capita in year t-1	0.855***	0.836***
Grantcult_pc		Specific grants for culture from central budget per capita	0.001***	0.002***
L.Ownrevcult_pc		Own revenues from culture per capita	-0.0004**	-0.0003*
rev_pc		Logarithm of revenues per capita	0.112**	0.121**
ISA		Indicator of spending autonomy		0.342***
IRA		Indicator of revenue autonomy	0.049**	
L. investcult_pc		Investment for culture per capita in year t-1	0.0003***	0.0003***
Pop0_4_all		Socioeconomic variables	Share of population 0-4 in community	-0.479
pop5_19_all	Share of population 5-19 in community		0.159	0.55***
pop60more_all	Share of population older than 59 in community		-0.52	-0.098
men_all	Share of men in population		0.004	-0.526*
High_educ_all	Share of people with the highest degree of education in community in 2002 <sup>4</sup>		0.261***	0.303***
House_size_pc	Living area per capita <sup>5</sup>		0.00	-0.00
firms_pc	Number of private firms per capita		-0.172***	-0.141***
_part_1	Dummy variable representing part of Poland occupied in XIX century by Prussia (Austrian part is comparison)		0.011**	0.002
_part_2	Dummy variable representing part of Poland occupied in XIX century by Russia (Austrian part is comparison)	-0.06	-0.03	
popkm2	Cost variables	Density of population	0.00	0.00**
Inpop		Logarithm of number of citizens	-0.006*	-0.011***
House_of_cult		Number of houses of culture	0.002***	0.002***
museums		Number of communal museums	-0.002	-0.005***
cinemas		Number of communal cinemas	0.027***	0.025***
const			4,206	4,206
Number of observations			0	0
number of groups			304	304
number of instruments			221	221
Arellano-Bond test for AR(2)			0.097	0.095
Hansen test of overid. restrictions:			0.696	0.76

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01

<sup>4</sup> The data based on census made in 2002, there are no newer data about citizens education for local governments

<sup>5</sup> There are no data on citizens income in twons, the size of living area and number of private firms is a approximation of citizens private financial condition

The most interesting in my study are coefficient representing the relation between the autonomy of local unit and its spending for culture. These variables are significant and positively related, but the size of the impact is much stronger in the case of analysis of spending autonomy than in the case of revenue autonomy. 1% more revenue autonomy results in 0,05% more spending for culture, but 1% more independence in spending causes 0,35% more spending for culture. It means that spending autonomy better explains the differences in local spending for culture than revenue autonomy.

Among the variables representing a social and demographic characteristic of town/city society only the share of highly educated people is valid in both models. The more educated society, the highest are spending for culture. This is consistent with the presented theory of demand for cultural services. The economic characteristic of society representing by the variable – number of private firms- has a negative impact on public spending. The more firms mean highest private income, as presented above the relation between private income and public spending was not clear in previous studies. The negative relation which is found in my study could represent the state, that in the case of high-income citizens the interest in publicly sponsored culture could be crowded out by private cultural goods. The demographic structure of society, representing the share of different age groups and men in town/city is valid only in case of a model with spending autonomy indicator. If there are more small kids in society people have less time to spend it on cultural activity and spending for culture are smaller. Where there are more children and young people in school age, the expenditure on culture is higher, while when the share of men is bigger the spending is smaller.

The cost effects are also statistically valid. Generally, more cultural objects (except museums) the spending on culture are higher. The size of the population has a negative effect, when there are more citizens, per capita spending is smaller.

#### **4.1. Differences in fiscal autonomy and differences in determinants of spending on culture**

The results of presented econometric analysis are consistent with the theory and other studies and seem to represent preference matching effect in local spending policy. As mentioned important is a question if and how this effect changed with the level of fiscal autonomy. To answer that question I analyzed interaction effects, which help me to find if there are differences across groups of cities and town with the different level of autonomy. I divided the population of cities and towns into three groups- those where autonomy is high, moderate and low. Analyzing the whole population of cities and towns in years 2000-2014, I define the levels of indicator which represents first and third quartile of IRA and ISA for towns and cities. As highly autonomous units I define those which indicator of autonomy (separately for revenues and spending and for cities and towns) is higher than Q3 in eleven or more years. The low autonomous are units which autonomy indicator is smaller than Q1 in eleven or more years. The rest of population I define as moderately autonomous units. Table 5 summarizes the information about the number of units in every group and size of first and last quartiles. Finally, 49 towns and cities are defined as low spending autonomous, 267 as moderately and 53 as high. In the case of revenue autonomy, there are 35 municipalities in the low-autonomous group, 50 in high and 284 in moderate. As Table 5 presents those groups in case of revenue and spending autonomy are not



the same. There is a group of local units which are low (or high) autonomous on revenue/spending side, but moderate on spending/revenue side.

As Table 5 presents the level of spending for culture is different in those groups, it is logical taking into account the results of our previous models which presented the strong positive relationship between the level of autonomy and size of spending for culture. But even among those groups, it is a variation of spending for culture, so it is worth to ask if and how that variation is the results of the same as presented above determinants public spending for culture. Especially if and what are the differences of the influence of these determinants across groups and if effects of variables defining citizens preferences differ. To do this, I analyzed interaction effects. I included an interaction term between socioeconomic variables and dummy variable -D. Where D=0 for the moderate group, and 1 separately for lowly and highly autonomous groups, so we can compare effects on spending of lowly and highly autonomous groups to moderate municipalities.:

$$E_{it} = \alpha E_{i(t-1)} + \sum_k \beta_k soc_{it} + \sum_k \beta_{Dsock} Dsoc_{it} + \sum_k D\beta_{Dsock} + \sum_m \delta_m cost_{it} + \sum_n \gamma_n fin_{it} + \theta T + \varepsilon_{it}$$

**Table 5** Number of low, moderate and high -autonomous local units and their mean spending on culture

CITIES							
		IRA- number of units				the value of quartiles	Mean of spending per capita on culture
	Level of autonomy	low	moderate	high	Total		
ISA- number of units	low	3	6	0	9	below 0.447	88.59
	moderate	2	43	1	46		92.8
	high	0	5	5	10	above 0.556	138.67
	Total	5	54	6	65		99.22
the value of quartiles		below 0.308		Above 0.408			
Mean of spending per capita on culture		88,28	94,26	154,53	99,22		
TOWNS							
	Level of autonomy	low	moderate	high	Total		
ISA- number of units	low	14	26	0	40	below 0.445	65.04
	moderate	15	190	16	221		78.18
	high	1	14	28	43	above 0.554	117.95
	Total	30	230	44	304		81.96
the value of quartiles		below 0.363		above 0.474			
Mean of spending per capita on culture		76,05	75,71	114,78	81.96		

The results of the interactions are presented in Table 6. In the first column, it is confirmed that differently autonomous units spend differently on culture. Lower autonomous localities spend less on culture than moderate, while higher revenue autonomous spend more than moderate. Generally, there are no significant variances among groups in the effect of analyzed socioeconomic variables on spending on culture. In the case of groups divided on ISA the only difference is in the case of a share of school-age people in society (column 3). But it seems that in both low autonomous and high autonomous local units the effect is stronger than in a moderate group. The same is the result of the share of higher educated people and IRA groups (column 4). Interesting is interaction in the case of a number of firms in city/town in IRA groups (column 5). As presented in previous models (Table 4) in the whole population the sign of the coefficient is negative. While separating different groups we found, that in the moderate group the coefficient is positive, but in highly autonomous local units the effect of this variable on spending for culture is much smaller (but still positive).

**Table 6** Interaction analysis

	1	2	3	4	5
variables:	only dummy	pop0_4_all	pop_5_19_all	High_educ_all	firms_pc
ISA-low	-0.024***	-0.046	-0.043**	-0.044**	-0.027
ISA-high	-0.007	-0.033	-0.027	-0.011	0.008
variable		-0.901**	0.544***	0.277***	0
variable-group low		0.463	0.1 <sup>xxx</sup>	0.228	0.029
variable- group high		0.566	0.122 <sup>xx</sup>	0.066	-0.122
Arellano-Bond test for AR(2)	0.094	0.093	0.095	0.095	0.094
Hansen test of overid. restrictions:	0.745	0.703	0.748	0.727	0.729
IRA-low	-0.025***			-0.062***	-0.026
IRA-high	0.031***			-0.001	0.051***
variable				0.124	0.195***
variable-group low				0.438 <sup>xxx</sup>	0.016
variable- group high				0.37 <sup>xxx</sup>	-0.176 <sup>x</sup>
Arellano-Bond test for AR(2)	0.095			0.094	0.095
Hansen test of overid. restrictions:	0.355			0.370	0.321

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01- statistics from GMM model

<sup>x</sup> p<0.1; <sup>xx</sup> p<0.05; <sup>xxx</sup> p<0.01- statistics of Wald test, that coefficients for moderate and for high/low autonomous group are equal to each other, with p value lower than 0.1 (0.001 or 0.001) I reject these hypothesis

## 5. Conclusions

Spending on culture is only small and very diversified part of towns and cities budgets. But the role of sub-sovereign governments in creation and organization of cultural sector is crucial in Poland because more than 70% of public spending related to culture goes from local budgets. What's more, local spending on culture is almost autonomous- there are no special rules or specific grants which influence local decisions. That is why we could analyze local spending on culture using demand framework, which expresses preference matching idea of decentralized spending. In my analysis, I found that towns and cities spending on culture was truly determined by the socioeconomic characteristic of local society. According to other studies on citizens preferences related to public spending, more educated people, school kids or women desire more cultural services. In my econometric analysis, I present that Polish cities and towns where those groups are more important in population, spend more on culture. But the possibility of local governors to finance cultural services is limited by the fiscal limitation of public budgets. In my study, I present that not only the size of the local budget is important, but also the real autonomy related to the local revenues and spending. The problems of limits in revenue autonomy are the theme of many studies, but there are few studies which analyzed spending autonomy limits. While in practice in every country local spending is limited not only by central government grants but also by different rules on quality and quantity of locally provided services. Especially important are limitations related to welfare services- like education or social assistance- this is also the case in Poland. I established spending autonomy indicator, which took those regulations into account. As my study presents, the limits in spending autonomy much better than in revenue autonomy explain differences in towns and cities spending on culture. 1% more revenue autonomy results in 0,05% more spending on culture, but 1% more independence in spending causes 0,35% more spending on culture. Despite the magnitude of the influence of limits in autonomy on local spending, I do not find in my study the differences on preference matching among groups of towns and cities with different autonomous groups. The only difference is the size of spending, but the allocation pattern is similar. This finding expresses the allocative efficiency of decentralization. If only local units have autonomy to decide about spending they allocate it according to citizens preferences. But on the other hand, this finding is an expression of equity problem when citizens in different towns and cities receive a different level of public services. But as I present the solution is no grant or regulation which force local governments to do something, but rather more autonomous budgets on revenue and expenditure sides.

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# EHEALTH SERVICES VALUE PROPOSITION FOR HEALTHCARE PROVIDERS: A CASE STUDY OF THREE LARGE HOSPITALS IN NEW DELHI

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*eHealth services are an emerging solution to address the issues of healthcare accessibility, affordability, and financial viability in developing countries like India. This study focuses on the degree of implementation of different categories of eHealth (Electronic Health Records, Telemedicine and mHealth) by three large private hospitals of New Delhi and the benefits and challenges faced by them during implementation. Data was collected through semi-structured interviews with different stakeholders in the hospitals. These hospitals are at different stages of implementation of eHealth but there is clear intent to use it for improving customer experience and making healthcare more accessible.*

## 1. Introduction

According to the World Health Organization (WHO) World Health Statistics 2013, India has a ratio of 6.5 doctors, 10 nurses and 9 beds per 10,000 people compared to the global average of 13.9 doctors, 29 nurses and 30 beds (Fortis, 2014). In order to meet the healthcare requirement of its population of 1.25 billion, India needs an additional 1.54 million doctors, 2.4 million nurses and 2.6 million beds (Fortis, 2014). At the same time the healthcare facilities are heavily concentrated in urban areas because of higher average revenue per operating bed (ARPOB) while more than 68 percent of the population resides in rural areas (Apollo Hospitals, 2014). Out of these 700 million people residing in rural areas, as per the National Rural Health Mission Report, 66 percent do not have access to critical medical care and 31 percent of them have to travel more than 30 kilometres to seek healthcare facilities (Gramvaani, 2014).

Technology can play a critical role in bridging the gap between the demand and supply for healthcare services and addressing the issues of accessibility, affordability and viability that have been of major concern for the healthcare sector. eHealth is defined as providing information and communications technologies (ICTs) enabled solutions for healthcare related activities. There are different forms of eHealth that include Telemedicine, ePrescriptions, mHealth, Electronic Health Records (EHR), and Health Knowledge Management. Telemedicine is a form of eHealth that uses communication networks for delivery of healthcare services and medical education from one geographical location to another. It is a useful means of managing healthcare issues of shortage and uneven distribution of healthcare infrastructure and human resources. mHealth involves using mobile devices for providing health

services while EHR enables the recording and communication of patient data between different healthcare professionals and systems.

Health care providers across the globe are increasingly adopting Electronic Medical Records (EMR) or EHR systems with countries like Norway (98 percent), Netherlands (98 percent), United Kingdom (97 percent), New Zealand (97 percent) and Australia (92 percent) having nearly universal use of EHRs (Mossialos, Wenzl, Osborn, & Anderson, 2014). The extent of adoption continues to remain a challenge. As per the study by HIMSS in 2012 and 2013 it was estimated that 73% of EHR implementations are, “not using the system as intended 12 months after implementation” which depicts the struggle in EHR implementation (HIMSS, 2014).

The market for telemedicine is expanding and is expected to be worth US\$ 34.27 billion by the end of 2020, with North America accounting for more than 40% of the global market size (Mordor Intelligence, 2013). In developing countries telemedicine is a useful means of reaching out to rural communities and meeting their health care needs which are otherwise difficult to satisfy. Adoption is also a key challenge on the telemedicine front as over the years numerous pilot sites, trials and tests have been developed in different countries but very few of these initiatives have survived beyond the end of the initial funding period (Healy, 2008).

As per a recent survey of World Health Organization (WHO) 83 per cent of its member states have reported at least one or more than one mHealth initiative in their respective countries. It was also emphasized in the same report that though mobile applications are generating a lot of interest, however, countries are reluctant to commit long term investments in mobile solutions due to the unavailability of supportive evidence of its utility (Marshall, Lewis, & Maxine, 2013).

## **2. Research Gap**

The main motivation for this study is the lack of empirical work on the status of eHealth implementation by hospitals in India. For the success of eHealth in India it is important that healthcare providers, especially private hospitals, implement eHealth services and use them to their full potential. To do so, it is important to first understand the extent of eHealth implementation in hospitals especially those in metropolitan cities where implementation is expected to be higher as both the providers and patients are considered to be more technology savvy. The geographical scope of this study is limited to New Delhi.

## **3. Objective**

The objective of this study is to understand the extent of implementation of eHealth services in three large hospitals in New Delhi and the benefits and challenges faced by them during implementation of eHealth initiatives. This study also focuses on the perspective of different stakeholders towards these initiatives in terms of the value proposition derived by them. The stakeholders considered for this study are patients, doctors, nurses, management and critical administrative functions like IT, finance and



medicine supplies. The future plans of these hospitals to take up new initiatives in this area is also studied in detail.

## **4. Research Methodology**

Qualitative research methods were used and the research design was case studies. A case study research design is considered useful for testing whether the theoretical concepts and ideas actually work in the real world. The study on eHealth implementation tests how the concept of eHealth performs in the context of a developing country like India. As part of the case study research design, data was collected from three hospitals in the New Delhi through semi-structured interviews with different stakeholders in the hospitals. Additional follow-up information was also obtained through email with the contacts at the hospital after the personal visits.

## **5. Case Study 1: Hospital 1**

The information was gathered through personal interviews with the Deputy General Manager (DGM) Business Solutions, and Senior Manager of Information and Technology (IT) department.

### **5.1. eHealth Implementation at Hospital 1**

Hospital 1 launched its own mobile app in January 2016 which is a single platform for all its chain of hospitals. A patient can book an appointment through this app in any one of the 32 hospitals in its network. A single patient ID is created for each patient and this ID is then used for all interactions with the patient. Currently, the app is used for the purpose of finding a doctor, scheduling appointments, online payments, and downloading reports. This app is linked to the diagnostic system (which is the diagnostic company under its group of companies) and thus the user can download their diagnostic reports through the app. In the next phase the hospital is planning to add billing, prescription/clinical notes of surgery, and radiology reports to the app which will be incorporated by December 2016.

The portal is used as a single platform for booking all appointments at the hospital both by the consumers as well as the hospital administration. Thus, the appointments booked by the consumer through the app and by the hospital appointment booking desk in the same system get merged for scheduling of appointments. The app is cloud based and currently around 60,000 users are using the app for booking appointments.

Hospital 1 is also planning to take marketing initiatives in the next three months to promote this app so as to increase its usage by consumers.

The app is useful for all stakeholders involved in the process. The patients can take an appointment with the doctors from anywhere and can visit the hospital according to the appointment which saves traveling and waiting time for the patients. Doctors can schedule their OPDs and personal holidays based on the schedule of

appointments. Nurses and other staff are also given computer training as part of their induction and on-job training and thus are able to work on these systems without any difficulty.

## 6. Case Study 2: Hospital 2

The information was gathered through personal interviews with the head of the departments (HODs) of Information and Technology (IT) and Finance and Accounts (F&A).

### 6.1. eHealth Implementation at Hospital 2

Hospital 2 has automated its processes from the year 1999 and has been updating it periodically based on the feedback and requirements of its users. The majority of users of the system are the administrative staff followed by paramedical staff, i.e., the nurses. Hospital 2 has a Health Information System (HIS) in place which is a customized solution developed by Akhil Systems. Akhil Systems has also implemented their HIS in other hospitals in the city (Akhil Systems, 2016). Hospital 2 has implemented the following modules of HIS:

1. Patient Registration
2. OPD Billing
3. Laboratory Information System (LIS)
4. Radiology Information System (RIS)
5. Operation Theater (OT) Management
6. Doctors Accounting
7. Medical Records (which includes ICD coding (ISP10), statistical reporting, total number of admissions under Economically Weaker Section (EWS) category)
8. Purchase and Supply Management
9. Human Resources and Payroll Management

The middle and top management uses the data generated through HIS for analyzing daily reports such as the number of OPD/IPD registrations and patients per specialization/doctor/disease for routine and strategic decision making.

Hospital 2 is in the process of implementing an EMR system. They are meeting with EMR companies to understand their products and decide which system will suit their requirements. The following are the reasons for the hospital to implement an EMR system:

1. **Requirement of Medical Records Department:** Maintaining the files of patients in physical form has its limitations. As per the guidelines of the government, hospitals need to maintain patient records for at least 3 years and for medico-legal cases like accidents and medical disputes, records need to be kept for a lifetime. The hospital maintains record of its patients for 5 years and as a result has more than 150,000 patients' records. They need an EMR system to maintain these records in electronic form.
2. **Requirement of Health Professionals:** Doctors need an EMR system so that they can review patients' records faster and from any location. Patients suffering

from chronic diseases like those having undergone cardiac surgery may come for a follow up after years. With physical records, the doctors' need to have them retrieved which consumes a lot of time. After implementing an EMR system, doctors can access patient records on their devices.

3. **Clinical Support:** EMRs help in recording critical patient information like past treatments and surgical notes which is useful for health professionals in making clinical decisions.

While choosing the EMR system, the hospital is looking at the following factors:

1. **Interoperability:** With Healthcare Information System (HIS) and Picture Archiving and Communication System (PACs). Lab reports and other data should get easily transferred from HIS to EMR.
2. **Technology:** EMR should be cloud-based and accessible from any location.
3. **Cost:** EMR system should be cost-effective.

## 7. Case Study 3: Hospital 3

The information was gathered through personal interviews with the Vice-President of Clinical Data Analytics, Senior Consultant (General Surgery), Senior Consultant (Urology and Andrology) and three nurses.

### 7.1. eHealth Implementation at Hospital 3

Hospital 3 is one of the few private hospitals in India which is implementing eHealth to improve the quality of care provided. The hospital has established its own telemedicine system in order to provide cost-effective tertiary level health care service delivery across rural and urban locations and to avoid capital expenditure involved in setting up hospitals at multiple locations. The telemedicine system connects these health centers located in remote areas to their highly specialized staff and technical equipment situated at tertiary and specialty healthcare services.

Hospital 3 uses a Computerized Patient Record System (CPRS) to record patient information which is used by doctors to access patient information like health history and medication taken. Hospital 3 uses a cloud-based system which is outsourced to Dell.

On interviewing the doctors shared the information that the only HIT which they are using is CPRS hence no paper work is done. The hospital has also an application for patients to book appointments on the phone. They feel that the usage of technology is necessary but deploying everything on IT will cause security and privacy concerns and the sense of satisfaction while dealing with patients face-to-face will not be attained.

Discussing the technologies used by doctors, one of the doctors remarked: "Our hospital has telemedicine facility but it is still not adopted in this hospital from the healthcare professional's side. The only technology which they work is CPRS which records patient's information and is on the cloud."

The nurses in this hospital are fully trained to record every detail on computers. Hospital 3 has a computer-on-wheels facility which keeps track of patients. Face-to-face interaction with nurses revealed that they were satisfied with the technology being implemented in the hospital that makes their work easier unlike in semi-urban hospitals where nurses need training and support.

## 8. Conclusions

We can conclude from the study done on these three large hospitals of New Delhi that they have realized the importance of using eHealth to reach out to patients and are taking initiatives in that direction. Though they are at different stages of implementation of different forms of eHealth but there is a clear intent to extensively use it for improving customer experience and making healthcare more accessible to the population. Hospital 1 is implementing mHealth to empower patients and provide them with a convenient way to connect to the hospital. On the other hand, Hospital 2 is in the process of implementing EHRs that will help them in providing better services to patients as these records will support health professionals in clinical decision making. Hospital 3 is making efforts to use telemedicine to reach out to patients in remote locations and provide them with healthcare facilities. They are also using EHR to store patient records in electronic form. It was also observed that adoption of technology is high among the healthcare professionals in these hospitals. They understand the utility of these technologies and at the same time being computer literate they do not face much difficulty in using these eHealth applications. The nurses and other support staff are imparted computer training as part of induction and on-job training so they are able to use these technologies conveniently. The adoption of these eHealth applications is still not very high among the patients which acts as a hindrance in the success of these eHealth initiatives. Though the hospitals are trying to spread awareness about these initiatives the results are still not satisfactory. In order to make eHealth initiatives successful it is important that all stakeholders, including patients, use these applications for a better healthcare experience and results.

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# EXAMINING THE MODERATING EFFECTS OF FIRM GENERATED CONTENT ON ONLINE SOCIAL BRAND ENGAGEMENT

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## Abstract

*This research furthers our understanding of the influence of social presence on social brand engagement (SBE) and the moderating effects of firm-generated content and consumer commitment. Employing a quantitative survey design, 738 consumers with prior experience in following brands on social media were randomly interviewed using online questionnaire. The findings suggest that social presence influence social brand engagement, however, this is significantly moderated by the firm-generated content and the consumers' level of commitment in engaging with the brand. The findings provide insights into the potential role of SBE and social presence in advancing the broader understanding of brand relationship management, brand engagement and social media research.*

## Introduction

Recent technological advancements and the buzz surrounding the use of social networking sites by consumers have changed the media landscape and how firms engage with their customers (Felix et al., 2017; Hammedi et al., 2015; Kumar et al., 2016; Pagani and Malacarne, 2017). The adoption of information technology by firms to engage with customers has been extensively researched (Hajli, 2014), however, these studies have mainly focused on how user-generated content (UGC) influence market outcomes in a number of contexts (e.g., Laroche et al., 2012; Stephen and Galak, 2012; Toubia and Stephen, 2013). To this end, Kumar et al. (2016) call for further research to examine the level of influence of FGC (e.g., informative and transformative) on social brand engagement. In a related study, Hudson et al. (2016) call for a need to further examine the connection between social media interactions and consumer brand relationship. This study therefore, responds to these calls to investigate firm-customer social brand engagement from the social presence theory (SPT) perspective. We introduce a new theoretical perspective (i.e., SPT) to shed light on actors' social media presence and the moderating effects of FGC and consumer's level of commitment on social brand engagement.

The objectives of this study are three-fold. First the study examines the influence of social presence on social brand engagement. Second, we examine the moderating role of firm-generated content and consumer commitment on social brand engagement. Finally, we seek to establish the relative effects of social brand engagement on brand

usage intent and e-WOM. The findings provide insights into the potential role of SBE and social presence in advancing the broader understanding of brand relationship management, brand engagement and social media research.

The rest of this paper is organized as follows: first, we provide a review of the theory related to social presence, consumer brand engagement and firm generated content leading to model and hypotheses development. Next, we describe the research methodology and discuss the statistical results. Finally, the findings are presented, followed with discussion and implications for theory and practice, and conclude with limitations and future research directions.

### **Social presence**

The social presence theory (SPT) evolved from the use of telecommunications and outlines how individuals engage in the use of social media as they see it as a form, behaviour, or sensory experience that projects some form of intelligence and social acceptance (Tu, 2000). Tracing its roots in the “social psychological theories of interpersonal communication and symbolic interactionism”, the theory has been applied in the “context of mediated communication” (Cui et al., 2013, p. 662), which is also extended to social media research to explain the social presence concept (Chang and Hsu, 2016; Nowak, 2013). Accordingly, Biocca and Harms (2002) conceptualise social presence into three levels that include; the perceptual level of awareness of co-presence with others, social presence typified by the subjective judgement which elaborates the psycho-behavioural accessibility of others, and the mutual social presence or the inter-subjective social presence that illuminates the dynamic interactions between participants. This conceptualisation aligns well with Short et al. (1976) unidimensional consideration of social presence as a subjective quality of the medium, which is determined by the perceptions of the social participants. While the subjective quality of the medium makes interactions more social and salient, this increases social presence on the part of the customer (Nowak, 2013), which is likely to enhance their brand engagement practices on social media

### **Consumer brand engagement via social media**

Consumer brand engagement (CBE) has generated an increased attention in both practice and research in recent times. Various authors have defined brand engagement as a multidimensional construct comprising cognitive, emotional, and/or behavioural dimensions (Brodie et al., 2013; Dessart et al., 2015; Dwivedi, 2015; Hollebeek et al., 2014). Hollebeek et al. (2014, p. 154) conceptualise consumer brand engagement as “a consumer's positively valence cognitive, emotional and behavioural brand-related activity during, or related to, specific consumer/brand interactions”.

From the social exchange theoretical perspective, firms focus much on relationship building which transcends beyond the transaction (Donaldson and O'Toole, 2007; Lambe et al., 2001). This implies series of interactions which are interdependent and contingent on the firm and customers involved (Cropanzano and Mitchell, 2005). From the social/relational exchange and social presence theoretical perspectives, we introduce the term social brand engagement (SBE) taking into account the increasing and critical role of social media in consumer brand engagement practices (Laroche et

al., 2012). Social brand engagement could be associated with the subject's self-image, which is driven by their level of belongingness to a social group (Escalas and Bettman, 2005; Hammedi et al., 2015). SBE is a full social act without boundaries that allows participants to engage in social interactions with brands and other consumers. Drawing from Kozinets (2014) and Laroche et al. (2012), we define social brand engagement as:

*The connection, creation and communication of the brand's story between the firm and consumers (both existing and prospects), using brand or brand-related language, images and meanings via the firm's social networking site*

In such associations, SBE may include an interdependence of the consumer, brand and other consumers, and more significantly, the consumer's level of commitment to engage in such practices. Drawing from the cognitive, emotional and behavioural dimensions of brand engagement (Brodie et al., 2013), it is envisaged that, these could be propelled by factors including "social status enhancement, social interactions, learning more about using the product and having fun" (Baldus et al., 2015, p. 983). In light of this, customers build brand knowledge and associations (Hammedi et al., 2015), brand usage intent, and motivation to engage in electronic word of mouth (e-WOM) (Abrantes et al., 2013; Habibi et al., 2014; Relling et al., 2016).

### **Firm-generated content (FGC)**

Firm-generated content (FGC) has mainly been prominent in the traditional media of advertising, in which case, the firm in a non-personal means directly communicates its messages to the target audience (Keller, 2016). Technological advancements in recent times have empowered both firms and consumers via increased access to information (Osei-Frimpong et al., 2016), which has also changed the nature or process of communication between the firm and the consumer (Gensler et al., 2013; Hudson et al., 2016; Labrecque, 2014). As a result, the role of FGC becomes increasingly essential in online CBE via the social media. Kumar et al. (2016, p. 9) explain FGC as "the messages posted by firms on their official social media pages". These messages are critically important, as they could enhance corporate credibility and trust on the part of the firm through their direct interactions with customers (Lee et al., 2006).

Kumar et al. (2016, p. 9) further explain FGC as a "multifaceted construct" likely to affect the target audience taking into account the "message sentiment, customers' response to the message, and customers' innate disposition" toward the firm's social media platform. This suggests that, FGC can focus on the unique brand attributes superior to competing brands (informational) or match brand to consumer aspirations, insights and experiences, and feelings (emotional including love, sexual desire, fear, guilt) (transformational) (Ashley and Tuten, 2015).

### **Model Development and Hypotheses**

Proponents of social presence theory assert that perceptions of social presence are subjective, which depends on the medium's objective quality (technological social presence) (Biocca and Harms, 2002; Gunawardena, 1995; Short et al., 1976; Tu, 2000; Walther, 1992). The intimacy resulting from interactions propagated by social presence enhance consumer's feelings and also provide a platform for learning (Dunlap and Lowenthal, 2009), which could influence their preparedness to participate in brand



engagement practices. Hence, social presence encourage online social interactions fundamental to person-to-person communication (Nowak, 2013; Shen and Khalifa, 2008; Tu, 2000). Further, the intimacy enshrined in social presence provides a better understanding of participants' feelings of staying connected with other users of the medium and to a larger extent, the level of interactions among these users (Nowak, 2013), be it individual consumers or firms. These elements are more likely to enhance social brand engagement practices on the part of the firm. Escalas and Bettman (2005), Hammedi et al. (2015) and Dessart et al. (2015) associated individual's belongingness to a social group, strong networking or information value as factors that could also promote or influence social brand engagement. On this premise, we hypothesise that:

H1: Social presence is likely to positively influence social brand engagement

SBE tends to motivate the consumer taking into account their interactive experience with the brand (Hollebeek et al., 2014; Van Doorn et al., 2010). This in turn builds customer brand knowledge and associations (Hammedi et al., 2015), which is likely to influence brand usage intent, and motivation to engage in electronic word of mouth (e-WOM) (Abrantes et al., 2013; Habibi et al., 2014). Online SBE influenced by social presence, FGC and commitment could encourage such consumers to share their experiences with others via social media. The increasing use of social networking sites and the continuous sharing of information among consumers (Anderson et al., 2016) provides an avenue to promote e-WOM (Relling et al., 2016). e-WOM is explained as "any positive or negative statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet" (Hennig-Thurau et al., 2004, p. 39). Abrantes et al. (2013) found that consumers' familiarity with brands enabled by some cognitive activities and experiential learning encourages them to engage in e-WOM. We therefore, argue that SBE is more likely to encourage consumers engage in e-WOM, thus we hypothesise:

H2: Social brand engagement practices is positively related to positive e-WOM to others

As earlier noted, social brand engagement includes the concept of dedication and commitment on the part of the consumer (Hsieh and Chang, 2016), and their compelling interactive experiences with the brand (Mollen and Wilson, 2010). In this vein, SBE could serve as a means to build and strengthen consumer relationships with brands, which is likely to influence their brand usage intent (Brodie et al., 2013). For the purpose of this study, we explain the term 'brand usage intent' as *a consumer's intention to purchase and use a particular brand (compared to others with similar attributes) for her good self, with others or for others*. Previous researches have found a significant positive relationship between CBE and loyalty intentions (e.g., Algesheimer et al., 2010; Dwivedi, 2015) and consumer purchase intention (Algesheimer et al., 2010; Hsieh and Chang, 2016). Thus, we hypothesise:

H3: Social brand engagement practices is positively related to consumer brand usage intent

Similar to the above discussion, we argue that engaging in positive e-WOM will help create brand awareness to others, which in a way could excite brand usage intent from

other consumers. Past studies have alluded to a possible increase in sales of brands/products as a result of positive WOM (e.g., Duan et al., 2008). López and Sicilia (2013) admonish firms to engage in early WOM marketing to generate conversations on social media among others to speed up the product adoption process. Thus we hypothesise that:

H4: Positive e-WOM is positively related to consumer brand usage intent

**Moderating effects of FGC and commitment**

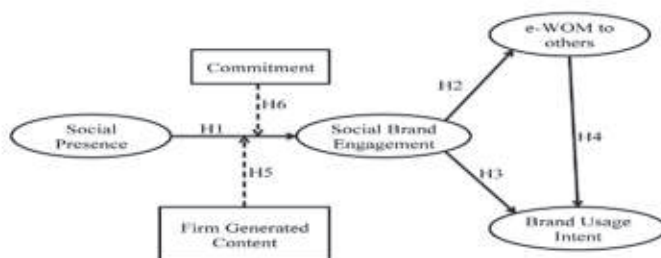
From the above discussions, we argue that even though social presence is likely to provide a platform for social brand engagement, this process could be moderated by the firm generated content (FGC) (Kumar et al., 2016) as well as their behavioural ties (e.g., commitment to the brand) (Hudson et al., 2016; Sung and Campbell, 2009). As FGC reflects messages posted by firms on their social media platforms (Kumar et al., 2016), Lee et al. (2006) particularly reiterate the critical importance of these messages in enhancing direct interactions with customers. Hudson et al. (2016) consider consumer level of commitment as a behavioural tie that could have a significant effect on a person’s engagement with a brand. Commitment is considered a key variable that influences a number of behaviours on the part of the consumer, especially with regard to engagement practices and on-going relationships (Hsieh and Chang, 2016; Sharma and Patterson, 2000; Sung and Campbell, 2009). Consumer’s engagement commitment is conceptualised as a consumer’s belief that an on-going brand engagement and relationship is worth investing (Sharma and Patterson, 2000). Hence, consumer’s commitment to a brand is likely to enhance or reinforce their brand-relational exchange (Chaudhuri and Holbrook, 2002), which is also more likely to moderate their SBE. Thus we develop the following hypotheses:

H5: FGC strengthens the effects of social presence on social brand engagement

H6: Consumer’s level of commitment reinforces the effects of social presence on social brand engagement

Following the above discussions, a hypothesised model is presented in Figure 1. The model shows the various path relationships as explained in the model development above.

**Figure 1: Hypothesised Model**



## Methodology

To evaluate our hypothesised model, we employed a quantitative survey design using an online questionnaire with inclusion/exclusion criteria to only involve respondents with some prior experience with social media brand engagement. We did not limit ourselves to one particular social networking site (see, VanMeter et al., 2015) and also did not focus on any particular brand. We randomly recruited 1250 consumers of social media in Ghana, who have experience following and engaging with brands on social media. Prior to the main study, the research instrument was pretested with 25 respondents from the population of interest. A preliminary analysis of the pilot study indicated all scales satisfied the internal consistency recording a Cronbach Alpha  $\alpha > 0.7$  (Osei-Frimpong, 2017). In addition, all scale items measured a corrected item-total correlation of  $> 0.3$ , which justified their inclusion in the questionnaire used in the main study (Osei-Frimpong et al, 2016).

## Data collection

In the main study, consumers of the following social media: Facebook, Twitter and LinkedIn were interviewed using an online questionnaire. Respondents who have followed and engaged with brands on social media for a minimum of six months were included in the study. In all, 775 (out of 1250) qualified respondents completed the questionnaire. An initial screening of the completed questionnaires resulted in 738 useable questionnaires, after discarding responses with missing values of three or more (cf, Hartline et al., 2000). Hence, the valid completed questionnaires used in the analysis represented a response rate of 59.04%.

## Analysis and results

Preliminary analysis was conducted using SPSS 23.0 to assess the normality of the data and the level of interrelatedness among the items to measure a single construct. All scale items measured a Cronbach alpha  $> 0.7$  with a correlation significance at the level of  $\rho = 0.05$ . We further conducted a confirmatory factor analysis (CFA) using AMOS 23.0, employing the maximum likelihood estimation. The factor loadings (see Appendix 1) and the fit indices indicated a reasonably fit to the data ( $\chi^2_{(382)} = 1124.716$ ,  $\rho = .0001$ ,  $\chi^2/df = 2.944$ ; GFI = .919; CFI = .961; RMSEA = .051). Byrne (2010) note that RMSEA values of  $< .05$  indicate a good fit, and values as high as .08 indicate a reasonable fit, which suggest that our RMSEA value of .051 is acceptable.

## Validity and construct reliability

Following Fornell and Larcker (1981), we assessed the discriminant and convergent validity of the measures. The results presented in Table 1 indicate convergent validity was satisfied following the average variance extracted (AVE) values above .50 and construct reliabilities  $> .70$ . In addition, discriminant validity was supported since the AVE values for each construct was greater than the square of their correlations (Hair et al., 2006; Pagani and Malacarne, 2017). Further, there was no evidence of cross-loadings. Satisfying validity and reliability concerns of the measures indicate their acceptability for hypothesis testing (Mathieu and Taylor, 2006).

**Table 1: Validity and Construct Reliability Measures**

	CR	AVE	SBE	COM	FGC	BUI	e-WOM	SOP
<b>Social Brand Engagement (SBE)</b>	0.920	0.697	<b>0.835</b>					
<b>Commitment (COM)</b>	0.889	0.729	0.247	<b>0.854</b>				
<b>Firm Generated Content (FGC)</b>	0.906	0.707	0.410	0.280	<b>0.841</b>			
<b>Brand Usage Intent (BUI)</b>	0.885	0.660	0.360	0.207	0.302	<b>0.812</b>		
<b>e-WOM</b>	0.826	0.542	0.310	0.495	0.348	0.210	<b>0.736</b>	
<b>Social Presence (SOP)</b>	0.967	0.788	0.269	0.240	0.405	0.240	0.262	<b>0.888</b>

*CR – Construct Reliability; AVE – Average Variance Extracted*

### Structural model estimation results

The full structural model evaluation (without the moderating variables) was done using AMOS 23.0, and the results suggest an acceptable model fit to the data. The model evaluation presented the following fit indices ( $\chi^2 = 474.864$ ,  $df = 178$ ,  $\rho < 0.001$ ,  $GFI = .944$ ,  $AGFI = .927$ ,  $CFI = .968$ ,  $RMSEA = .048$ ). A detailed list of the standardized path coefficients with their respective t-values and  $R^2$  are presented in Table 2.

**Table 2: Structural parameter estimates (standardized coefficients)**

Paths	Standardised coefficients		
	$\beta$	t-value	$R^2$
Social Presence → Social Brand Engagement (H1)	.434 <sup>***</sup>	9.845	0.189
Social Brand Engagement → e-WOM (H2)	.401 <sup>***</sup>	8.302	0.161
Social Brand Engagement → Brand Usage Intent (H3)	.198 <sup>**</sup>	2.266	0.082
e-WOM → Brand Usage Intent (H4)	.123 <sup>**</sup>	2.107	

<sup>\*\*\*</sup>  $\rho < 0.001$ , <sup>\*\*</sup>  $\rho < 0.05$

From Table 3, all hypotheses (thus, H1-H4) are supported. The results suggest that Social Presence significantly influence Social Brand Engagement. Supporting hypothesis H1 ( $\beta = .434$ ,  $\rho < .0001$ ,  $R^2 = .189$ ) implies that consumers not only use their online social presence to share personal pictures, videos and messages, but also spend a considerable amount of time to follow brands on social media. Supporting hypothesis H2 ( $\beta = .401$ ,  $\rho < .0001$ ,  $R^2 = .161$ ) indicates the critical effects of social brand engagement. Given the viral nature of messages or user comments posted on their social media pages or platforms, this finding should be given some prominence as consumer experiences in participating in social brand engagement practices could have dire consequences on the brand, especially in situations of negative experiences. With regard to hypothesis H3 ( $\beta = .198$ ,  $\rho < .05$ ,  $R^2 = .082$ ), though supported, social brand engagement had a weak influence on brand usage intent as compared to the effect on e-WOM. The consequence of the finding suggests consumers are likely to increase their intentions to use brands they engage on social media. Similarly, the level of influence on brand usage intent resulting from e-WOM is weak, though the hypothesis H4 is supported ( $\beta = .123$ ,  $\rho < .05$ ,  $R^2 = .082$ ). This finding also implies that, e-WOM is more likely to arouse potential customers to develop an intent of using a brand as a result of shared experiences or information from friends on social media.

### Interaction effects

Following the model evaluation to test the various hypotheses (thus, H1-H4), moderating effects were examined hierarchically using moderated SEM with AMOS 23.0 (Xanthopoulou et al., 2007). Following Ranaweera and Jayawardhena (2014) and Matear et al. (2002), additional variables were created to test the interactive effects. First we changed the continuous independent (Social Presence) and moderating variables (FGC and Commitment) through mean centring, then created an interactive term by multiplying the independent variable and the moderating variable. This resulted in creating the following interactive terms: ‘Social Presence X FGC’ and ‘Social Presence X Commitment’. The dependent variable (Social Brand Engagement) was regressed on the independent variable (Social Presence), the moderator (FGC or Commitment), and the interactive term.

As earlier noted, we conducted the interaction test hierarchically with AMOS 23.0 by first examining the moderating effects of ‘Firm Generated Content’ on the dependent variable. A significant interactive effect was examined supporting hypothesis H5, and the analysis also indicates the model fitted the data well as presented in Table 3. The effects are pronounced given the measures and respective R<sup>2</sup> as presented in Table 3. For instance, with 29.4% explained variance, the effects were much stronger compared to the main effects on the path Social Presence → SBE in Table 2.

**Table 4: Results of moderated SEM interactions of Firm Generated Content**

Path	Unstandardized Path Coefficient $\gamma$	t-value	Standardised path coefficient $\beta$	R <sup>2</sup>
Social Presence → Social Brand Engagement	.487	6.549	.553 <sup>***</sup>	.294
FGC → Social Brand Engagement	.326	3.391	.356 <sup>***</sup>	
Social Presence X FGC → Social Brand Engagement	.150	4.016	.198 <sup>***</sup>	
Model fit indices	$\chi^2 = 260.876$ , $df = 97$ , $p < 0.001$ , GFI = .960, AGFI = .943, CFI = .978, RMSEA = .048, PCLOSE = .680			

<sup>\*\*\*</sup>  $p < 0.001$

Following the steps outlined above, the interaction effects of Commitment on SBE were also examined. From Table 4, there was a significant positive moderation effect of Commitment on the influence of Social Presence on SBE. With 32.7% explained variance, the effects were much stronger compared to the main effects on the path Social Presence → SBE in Table 2.

**Table 4: Results of moderated SEM interactions of Commitment**

Path	Unstandardized Path Coefficient $\gamma$	t-value	Standardised path coefficient $\beta$	R <sup>2</sup>
Social Presence → Social Brand Engagement	.548	4.615	.596 <sup>***</sup>	.327
Commitment → Social Brand Engagement	.412	2.680	.472 <sup>**</sup>	
Social Presence X Commitment → Social Brand Engagement	.169	2.817	.238 <sup>**</sup>	
Model fit indices	$\chi^2 = 257.507$ , $df = 97$ , $p < 0.001$ , GFI = .960, AGFI = .943, CFI = .979, RMSEA = .047, PCLOSE = .721			

<sup>\*\*\*</sup>  $p < 0.001$ , <sup>\*\*</sup>  $p < 0.05$

## Discussion

The study proposes a framework for integrating social presence, social brand engagement and the moderating effects of firm generated content and commitment on the part of the consumer. Our results shed light on the need for firms to engage in social brand engagement practices with their consumers and other prospects. In line with Gensler et al. (2013), our finding suggests that social presence provide a platform for the firm's social brand engagement practices. This implies that while consumers spend a considerable amount of time on social media, there is a high possibility of engaging in social brand engagement practices as indicated in our results. In support of other studies (e.g., Kozinets, 2014; Laroche et al., 2012), we argue a strong relationship between social presence and social brand engagement.

In advancing our knowledge, we examined the moderating effects of firm generated content (FGC) on social brand engagement practices. Our results indicate the effects of social presence on SBE are strengthened by FGC. Unfortunately, most studies have focused rather on the effect of user-generated content (UGC) on brand engagement via social media (e.g., Laroche et al., 2012; Stephen and Galak, 2012; Toubia and Stephen, 2013). While UGC is important and well integrated in SBE (Gensler et al., 2013), we extend on their study arguing for the criticality of FGC in such brand engagement practices as reported in our findings.

In a similar vein, we found consumer's level of commitment to moderate social brand engagement practices. Whereas social presence encourages social interactions among participants on social media, their level of commitment to a particular brand is essential to incite them to build brand relationships (Hudson et al., 2016) and engage in SBE. Our results indicate both significant effects of the interaction term (Social Presence X Commitment) and Commitment as a moderating variable suggesting that Commitment duly acts as a moderator as well as an independent antecedent of SBE. In a related study, Gensler et al. (2013) include consumer brand relationship characteristics as a moderating variable in their integrated framework of social media's impact on brand management. Although the authors failed to highlight consumers' commitment as one of the characteristics, we focused on this consumer characteristic on the premise that customers' decision to engage with brands on social media is a choice, and therefore, consumers' level of commitment is considered critical in moderating their engagement practices.

## Theoretical implications

This paper contributes significantly to the literature on social presence theory, social brand engagement (SBE), social media and firm generated content (FGC). Our model in Figure 1 and the results shed light on the application of social presence theory to understand social brand engagement and its consequences. Most studies on social presence have focused on other perspectives, for instance, as an antecedent to social capital (Chang and Hsu, 2016), antecedent to community participation (Shen and Khalifa, 2008), and as an indirect consequence of instant messaging (Nowak, 2013). This work however, departs from these previous studies by establishing its positive influence on SBE practices when used as a vehicle in this regard. We conceptualise

social presence as a unidimensional construct (e.g., Nowak, 2013) and establish its relevance and application in SBE.

In order to better understand the dynamics of the influence of social presence on social brand engagement, we examined the moderating effects of FGC and consumers' level of commitment. While user-generated content has dominated studies on social interactions, very few have focused on FGC (e.g., Kumar et al., 2016), this paper projects the critical importance of FGC in promoting SBE. Our work supports the importance of SBE and why it matters in social media discourse. First, FGC as a moderator enhances firm-consumer interactions as well as building consumer-brand relationship through social brand engagement practices. An approach where firms provide brand related stories or information creates an avenue to manage brands, communicate and leverage brand awareness with customers.

Our conceptualisation integrates social presence theory, brand engagement, FGC, commitment and other consequences of SBE (i.e., e-WOM and brand usage intent), which presents a new dimension in social media research. We have provided a strong theoretical perspective to shed light on social media and brand engagement. The findings present insights to the potential role of SBE and social presence in advancing the broader understanding of brand relationship management, brand engagement and social media research.

### **Managerial implications**

Our findings suggest social presence as a vehicle for social brand engagement practices. In this regard, as social presence depends on the media information richness (Cui et al., 2013), managers should take into account the consumer's intentional, cognitive, or affective states and provide the necessary tools and practices on their social networking sites that could enhance the mutual understanding and psychological attachment among consumers. Firms should employ techniques that could arouse consumers' interest and curiosity to excite them to participate in the brand social interactions.

As firms social media platforms enhance a more personal level communication and interactions (Huotari et al., 2015), creative strategies in relation to FGC should be considered critical to win the attention of the consumer and one that would lead to repeat visits to interact. For instance, sharing interesting information about their brands, or on upcoming and on-going brand activities on social media platforms, could initiate discussions among members of the social media community. In addition, with regard to transformative creative appeal, managers should use positive emotional appeals (that portray humour, love, joy, etc.) to attract consumers, excite and arouse their interest to participate in such social brand interactions. This could be through the use of images, short videos as well as creative messages. In effect, since social presence promotes interactions, organisations should seek ways to understand and leverage social media phenomenon to engage well with consumers.

### **Limitations and future research**

This research provides empirical evidence backing the relationships between social presence and SBE, consequences of SBE, and the moderating effects of FGC and

commitment in SBE practices. The findings of this study provide robust support for the theoretical model and predicted relationships. However, like any research, this study was not without limitations. First, we took a general view of FGC as messages posted on the firm's social networking site by the firm. We however, did not examine whether there are any differences between informative and transformative creative strategies adopted by firms in engaging their customers on social media. Future research could examine the potential impact of these creative strategies (informative versus transformative) on SBE, which could provide interesting insights to build on our current work.

Given the conceptual difference between social brand engagement and brand community engagement, further research is encouraged in this endeavour to provide deeper understanding of SBE by exploring other possible moderators (other than FGC and commitment) and other potential consequences of SBE. While we focused mainly on positive e-WOM, it is possible that SBE could also result in negative e-WOM, and therefore, we encourage future research to explore this further to establish the potential effects.

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# EXPERIENCE CONTEXT CAPTURER (ECC): NEW APPROACH TO ANALYSE THE USER EXPERIENCE CONTEXT WITHIN THE INDUSTRIAL HMI ENVIRONMENTS

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*In the product and service design field, one of the most important innovation domains is the user experience. This emergent area is based on designing the experience of the user while interacts with a product, focusing on the motivations and emotional needs of the user. Furthermore, it analyses all the elements that compound the ecosystem of the product and service instead of just focusing on the Human Machine Interfaces (HMI).*

*In this context, the main objective of this communication is to present the new approach of the Experience Context Capturer. A new user centred tool that analyses the user experience context within the industrial HMI environments and its influence on the development of positive experiences. Thus, it is possible to identify critical factors of the context and propose new improving service solutions.*

## 1. Introduction

With the advent of the new manufacturing industry era, so-called Industry 4.0, the landscape of the industrial reality has changed significantly. The manufacturing processes have evolved, increasing the complexity degree of most traditional systems and creating new cyber-physical systems, which it has originated a wide range of innovation possibilities. The inclusion of ICTs within the manufacturing processes and in the resultant artefacts is opening a new spectrum of new services related to the installed product baseline. Thus, the new intelligent systems are able to gather, store and study data to offer new products and services that optimise the productive processes and develop the whole potential of this new industry (Lee, 2014). In this line, one of the main challenges of this new industry resides in transforming the generated data in service packages and provides value to the customers.

Nowadays most of the services are driven towards remote maintenance activities. However, data collected from machine monitoring could go beyond the preventive maintenance, offering service solutions that turn the production on more effective, efficient and highly personalized process. To do so, firstly, it is necessary to determine which data is relevant for different stakeholders, form

operators to managers, and thereupon transform data into services that are valuable for the customers through new Human-Machine Interfaces (HMI).

Due to this situation, the development of new HMIs is considered as one of the key challenges for the new industrial service solutions, among other things the data communication and the interaction optimization between the systems and the employees (Pfeiffer, 2016). Nowadays the HMI goes much further than the machine functions control. In fact, it helps for progression visualization during the fabrication processes, the instructions for manual activities, the administration of production tasks and the support through the integrated management for changes that may occur within the whole production process. Moreover, it will have to speed up learning processes, decision makings and enhance intelligence of employees, increasing their motivation and implication (Isen, 2001). Therefore, the new services that are offered through HMI solutions should be understood from a new perspective, where besides the efficient fulfilment of the tasks, they also should include emotional aspects.

In this context, the knowledge that product and service design discipline can provide are crucial. The new development framework should include initiatives that involve the user in the core activity, just like the User Centered Design (UCD) methodology of Diseinu Berrikuntza Zentroa (DBZ, 2014) suggest. Among other aspects, the user experience is considered as one of the key features that highlight the innovate potential of HMIs in the industrial machinery. Thus, the user experience could be considered as a field where the highest importance acquires the user emotions, consequently influencing in the human knowledge, learning processes, decision making and intelligence (Davidson et al., 2003). Besides, it is known that positive emotions can increase the user motivation and implication, enabling learning processes. Therefore, the user experience and the HMIs should be considered a suitable area to generate affect, efficiency, satisfactory interactions and guarantee learning processes in such a complex systems like the industrial machinery.

Nowadays, there is a big necessity within the methods and tools intended for materialization and optimization machine-tool interfaces from the perspective of the user experience and emotional development of the employees (Ardito et al., 2014). Tools such as the Eyeface (Lasa et al., 2015) unleash the research work related to methods and tools based on user experience, covering the necessity that was mentioned before.

As a result of this research line has been designed a new method, the Experience Context Capturer (ECC). This user-centered tool analyses the service optimizations in the context of the industrial HMI environments and its influence in the development of positive experiences. The new tool enable to identify its critical elements and suggest new improvement solutions. In this article the ECC tool will be presented, showing the expected results through its use in real manufacturing contexts.

## 2. Objective

The main objective of this communication is to explain the development of the Experience Context Capturer (ECC) method. This tool is based on the context where the experience takes place, evaluating its influence in the emotions of

the user and identifying key factors to optimize them and generate more positive experiences. Thus, the ECC enable to create/offer new and better services in the machine-tool sector.

### 3. The user experience

Service Design enables to identify which data is relevant for the user from the collected amount and designs new services that are able to capitalize and put them in value. To do so, it is necessary to adapt and develop a new framework to include it in the design processes that are already currently in the machine-tool sector. The user experience is an essential element within the service design discipline (Pullman and Gross, 2004). Thus, the “experience-centred services” enable to work on positive emotions, where the connections with the customer are created, enhancing and involving the user to the new service solution. The setting up of new experience-centred services requires systematic and consisted developments of the tangible and intangible elements for the complete offer of the service. And, within the tangible elements are listed the HMIs, where the experience in the interaction with the interface becomes a crucial aspect in the offer of new services.

The user experience, rather than just focusing on the functional efficiency of the products and services is appropriate for creating memorable experiences that fulfil the emotional needs of the users. This new approach has acquired great relevance in the interaction area (Kasfhi, 2016), because it allows evoking meaningful experiences that enhance the motivation and implication of the employees, providing service offers that are much more efficient and centred on the user needs. There is a wide variety of definitions about the user experience, but nowadays the most accepted is the one developed by the ISO standard 9241-110:2010 (2010), where it describes it as follows: “person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service. User experience includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours and accomplishments that occur before, during and after use. User experience is a consequence of brand image, presentation, functionality, system performance, interactive behaviour and assistive capabilities of the interactive system, the user's internal and physical state resulting from prior experiences, attitudes, skills and personality, and the context of use. Usability, when interpreted from the perspective of the users' personal goals, can include the kind of perceptual and emotional aspects typically associated with user experience. Usability criteria can be used to assess aspects of user experience.”

As shown in the definition, there are several aspects that influence in the user experience. Hassenzahl (2010) defined four key properties of the experience: *subjective, holistic, situated* and *dynamic*.

- Subjective:

The experience has to be analysed through a subjective point of view, it depends on each person the way that perceives, feels and experiments an interaction. From the same objective fact, several experiences can be evoked. Thus, is determinant to consider the user as the core element in the interaction,

the values, motivations and emotional needs of the user affect directly on the lived experience.

- Holistic

During the interaction experience there are three hierarchic levels of the objectives (Figure 1).

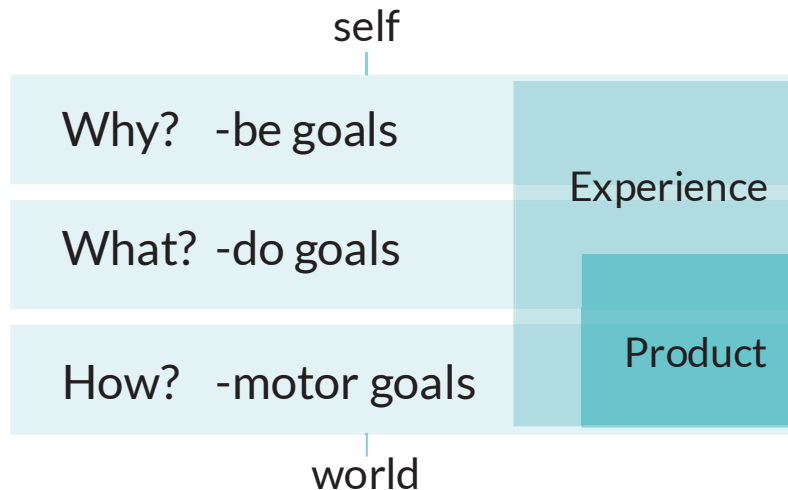


Figure 1: Three levels of the experiences (Hassenzahl, 2010)

The first two levels are related to the usability of the product, where the interaction area has been traditionally focused. Nevertheless, Hassenzahl from a more holistic point of view defines a third level of objectives related to the motivations and emotional needs of the user. The fulfilment of these aspects determines if the experience is positive or negative.

- Dynamic (vs static)

The experience is dynamic and considers the concept of time, what the user experiments, feels and perceives changes through the time. Three time periods are defined, the moment previous to the interaction, during the interaction and after the interaction.

-Situated (vs abstract)

The experiences are evoked through the integration of action, perception, motivation and emotion, but all them in a dialog of the user with the world in a specific moment and context (Figure 2).



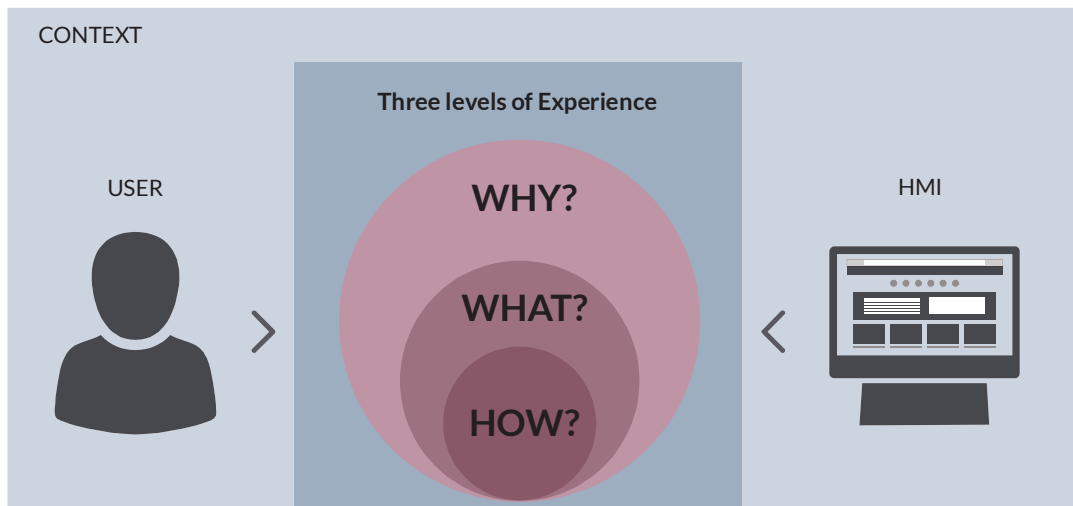


Figure 2: The experiences are situated in a context

#### 4. Elements of the experience

As expressed in the definition of the properties, there are several aspects that influence in the experience. On the one hand, it has been explained that the experience is largely subjective, which means that from one objective fact several different experiences can be evoked, so it is determinant to explore who is the main protagonist of the experience. On the other hand, it has been highlighted the holistic nature, where it is important to analyse both the functional and objective aspects of the interface and the motivations and psychological needs of the person. Furthermore, the experience has a dynamic nature, so the actions that the user experiments and the emotions perceived are examined during an exact period of time. Finally, the experience is situated in a specific place at a specific time, so the context analysis is essential to evaluate the experience of the employee while interacting with the interface. Thus the key elements that are considered are the following ones: User, Motivations, Interface, Actions and Context (Figure 3).

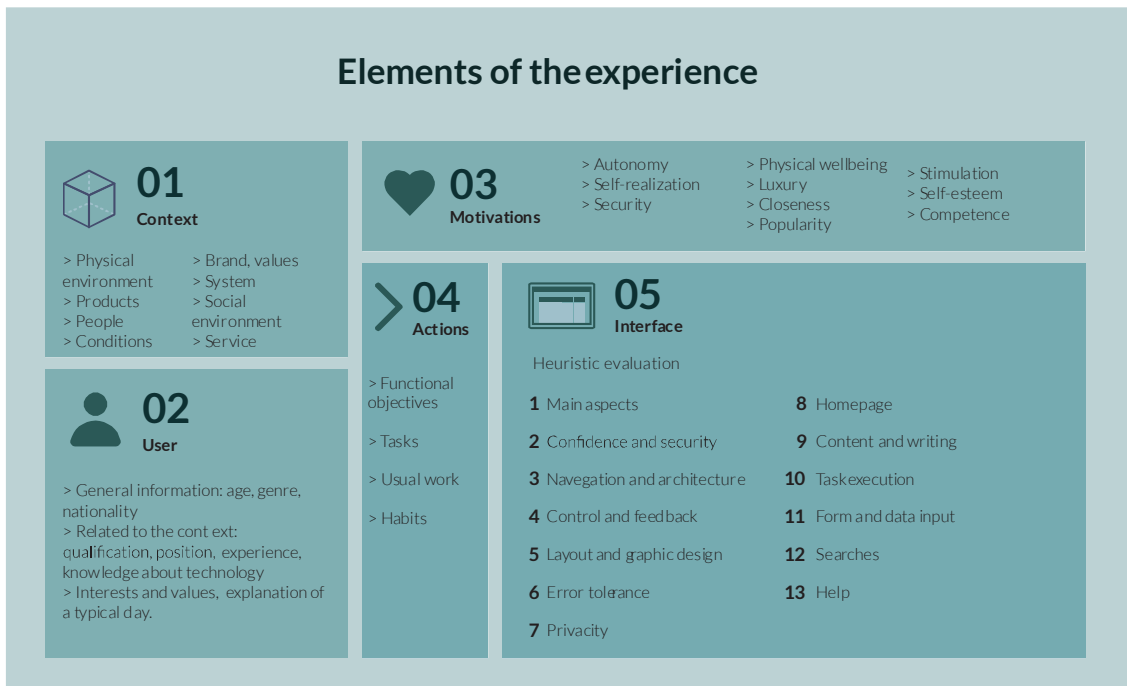


Figure 3: Elements of the experience

## 5. Experience context capturer

According to the theoretical approach defined before, the evaluation of the experience is based in the valuation of the suggested 5 elements. In this communication it has been deepened in the element of the Context.

As defined by Hassenzahl (2010), the experience happens in a specific moment and time, so the context affects directly in the assessment of the experience. Therefore through the Experience Context Capturer, the factors of the context that could influence in the experience are gathered.

When it comes to specify the determinant factors of the context it has been based on the model defined by Gomez and von Saucken (2014), on which they divide two principle levels within the context: the Micro UX and Macro UX (figure 4). In the first one, the context is analysed from a perspective nearer to the interactive system and the following elements are considered: physical environment, people, co-existing products and the product service. In the Macro UX, the field is wider and factors such as the brand and values, social environment, culture, service and the whole ecosystem of the digital environment are studied.



Figure 4: Context

## 5.1. Micro UX

### - Physical environment

It addresses the gathering of the information about the place where the machine is located, both from the objective perspective where the environment is described and the subjective opinion of the user. On one hand, it is defined for example if the place is big, if there are many machines around, if it is luminous, clean, etc., and in the other hand, it is gathered the evaluation of the user, if it is pleasant to them, or accessible, close and so on.

### - People

It is focused to the people working in the machine, to identify who are them and if they work in collaboration or always in an individual way. This section is not based on the user analysis, which it will be analysed in the User element, its objective is to identify the common users and their way of working.

### - Co-existing products:

It is oriented to the products that are used in the interaction with the interface, such as the computer mouse. These products affect directly in the experience of the employee.

### - Product service:

It is based on comprehending the functioning of the system, from the technical perspective, such as the resolution of the screen, the connexion, the server, the architecture, etc.

## 5.2. Macro UX

### - Brand and values

The brand influences directly to the user's perception about the product, in this case, a user that knows the brand and values of Danobat can have a different

opinion about the product that can have a user that has never heard about it. This perception could end up affecting in the final valuation of the experience, so it is important to work this aspect and to know the user's opinion about it.

#### -Culture

Large manufacturing companies such as Danobat work with several clients internationally, so the users of their machines could be from very different origins. Each culture has its own specific characteristics what makes determinant to identify their cultural values in the evaluation of the experience.

#### - Social environment

The machines are situated in environments where people with different profiles can interact. Understanding this social environment can provide knowledge about how can affect other people's behaviour in the user's experience.

#### - Service

Unlike the service element mentioned in the Micro UX, in this case is referred to the service from a wider point of view, i.e., to know which is the service that provides the machine, its functions and the usual way of work. The experience in the interaction with the interface is a tangible element within the complete service offer, so comprehending the service is determinant in order to understand the offer as a whole.

#### - Ecosystem of the product

This factor means to the knowledge about the machine itself, such as the model, typology, characteristics, etc., what brings information about the virtues and limitations of the machine and its influence in the final experience.

## 6. Discussion

Once defined the new framework it is required to validate and give value to the proposed ECC tool. It is posed to carry out experimentations in real manufacturing contexts where enables the HMI evaluation and the new service offers. Once the evaluations have been carried out, the features to improve the designed tool will be gathered, executing by iterative phases and experimenting in order to optimize the tool.

In order to use the Experience Context Capturer it is proposed to apply it in two stages: firstly, a previous survey and then an observation in the analysed context by the research team. It is intended to collect information and detail the environment as widely as possible, gathering the opinion of both users and the team itself.

During the survey, the general data of the user, such as age, gender, nationality and professional position, are collected first. It is interesting to gather information of the user because each opinion can be linked to the personality, and from the same context the assessment can be really different. In fact, the ideal would be to analyse the user in in more detail, focusing on its habits and personality, as mentioned about the Persona element. No specific description has yet been made of the factors to be analyzed about the person, which it will be done in future lines, but with the basic information mentioned it could be

possible to perform the experimentation. Once the information about the user is collected, questions about the context itself will be done. These questions will be focused on each section defined in the Micro UX and Macro UX frames. In most of the cases will be formulated as open questions, although in some sections such as the physical environment or brand related ones, in order to help and speed up the process several adjectives will be proposed where the user chooses the most appropriate ones.

After finishing with the survey, the design team will analyse the environment filling up the same survey from their point of view. In this way, different approaches can be considered, since the employees' opinion is considerably influenced by experiences previous to the survey, while for the team is the first contact with the system.

By using the ECC tool, different types of information can be gathered. On the one hand, in the case of the elements of Micro UX, it is possible to detect critical points that hinder interaction, such as the computer mouse, whose poor conditions hamper the use and therefore creates negative emotions in the user. These kinds of factors are identified easily and for its improvement is enough to replace it for a new one. On the other hand, if it is detected that within the Macro UX elements, the user associates the machine company brand with negative aspects, and therefore, the experiences are influenced by that negative linkage, the solution is much harder to find. In that case, it may not have a direct solution through the redesign of the environment of the interface, but it gathers really interesting information for the overall view of the company and its services.

## 7. Conclusions

The Experience Context Capturer tool responds to the actual necessity of service optimization methods and tools that are based on the improvement of the industrial HMI experiences. As a result, new service offerings are achieved where the employees feel more involved, motivated and more engaged with the workspace, which influences in the decision making and learning processes.

The ECC tool is oriented to the evaluation of real manufacturing contexts, with the aim of identifying critical points and improving them to optimize the experience of the whole service. The HMI context optimization improves the user experience, which besides of improving their motivation and implication facilitates the task execution and improves manufacturing processes.

In this new industrial era, the goal of the HMIs will have to evolve from the actual task performance visualization; they will start to communicate new data that will allow to generate new service packages that provide added value to the actual offers. Nevertheless, the evolution towards the intelligent industry should be complemented with the appropriate development of the HMIs, they should be adapted to the users so as to connect, engage and integrate them into the service experience. To do so, the ECC will afford an evaluation of the HMI context, detecting if it generates positive experiences in the user during the service as a whole. In this way, the manufacturing companies will have the opportunity to make evaluations of the service experiences which are based on

their manufacturing interfaces, in a quick way and providing a wide view about the key factors that should be improved.

## 8. Future lines

The tool ECC has been developed after several studies and the actual state of art of the user experience, covering the large necessity of tools within the discipline oriented to the industrial HMIs. However, being a first approximation and in the absence of similar methods, several experiments need to be done using the tool in real contexts in order to evaluate and improve based on the feedback received.

Furthermore, in the definition of the tool framework it is being mentioned that there are various aspects influence in the user experience and the following elements have been named: Context, Person, Motivations, Actions and Interface. In order to make an evaluation of the service experience as completely as possible, it is necessary to analyse these five key elements. This article is focused on the evaluation of the first element, the Context. Nevertheless, during the next steps of the research the aim is to deepen in the remaining four elements, defining them and analysing them. Thus, companies will have the opportunity to know how is the user experience that is based on the interaction with the HMIs and the value of their new services. As a consequence, they will be able to optimize their digital systems, adapting to the new service opportunities that offers the Industry 4.0 era.

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## HEALTHCARE SERVICES SUSTAINABILITY AND THE DEVELOPMENT OF PERSONALISED MEDICINE

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*Personalised medicine has come to stay. It seems inevitable that the mechanisms of health systems need to be adapted to this new reality, which not only conditions the environment in which clinical and economic agents operate but also affects patients and the general population. The literature does not yet offer magic formulas that guide this adaptation. However, most authors agree on the need to reinforce the role of economic evaluation in order to obtain specific validations in each case, be it for a new drug or a new diagnostic technology. In this regard, this work offers an economic evaluation of a specific case of personalised medicine applicable to patients with autosomal dominant polycystic kidney disease.*

### 1. Introduction

Personalised or precision medicine promises to radically alter healthcare services. These changes open up two controversial issues –organisational models and financial affordability.

Due to better matching of patients with treatments, personalised medicine and concretely targeted therapies can improve effectiveness and reduce side effects as well as costs of treating patients who either do not respond to or are adversely affected by a therapy. Thus, targeted therapies could conserve costs and resources. But this could also mean treatments becoming more expensive, since the costs of development would apply to a more limited population. Nonetheless, genetic tests, for instance, offer good opportunities for chronic disease prevention.

As regards chronic diseases, Autosomal Dominant Polycystic Kidney Disease (ADPKD) is the hereditary kidney illness that most frequently causes renal failure. Dialysis and transplantation are the therapeutic alternatives currently used. These renal replacement therapies (RRT) entail high health expenditures. As there is still no curative treatment for ADPKD, it seems advantageous to prevent its transmission.



The objective of this work is twofold. On the one hand, we will offer a literature review about the expected economic consequences of personalised medicine, and on the other hand, we present a particular case in which a preventative strategy for autosomal dominant polycystic kidney disease based on assisted human reproduction and preimplantation genetic diagnosis (IVF ICSI + PGD) will be compared with the current route based on renal replacement therapy (RRT - dialysis and renal transplantation).

Regarding the case-study, methodological aspects will be based on a cost-effectiveness analysis elaborated with information collected from the literature and from a registry of patients in the province of Granada.

First, we compared the costs of the IVF ICSI + PGD alternative with the RRT cost. Only direct costs associated with RRT, assisted reproduction, and genetic diagnosis have been taken into account. The RRT cost was obtained from the specialised literature. The average cost of a standard patient during the natural course of the disease has been calculated with patients' records from the registry of Granada (Spain). The cost of the preventative strategy is calculated by adding the costs of an assisted reproduction procedure in a public hospital and the market price of the PGD test in Spain. All costs were considered from the perspective of the Spanish National Health Service.

As effectiveness measure, the number of healthy children born from parents affected with the illness was used.

To evaluate the consistency of the results, a sensitivity analysis has also been carried out on the variable "number of embryo transfers".

In a scenario with three single embryo transfers, we obtained a lower cost-effectiveness ratio for the preventative strategy and also a favourable incremental cost-effectiveness ratio for the preventative strategy.

Currently it is generally accepted that personalised medicine reinforces the necessity of changing over from technology-centred to patient-centred evaluation of medical procedures. The analysed case confirms this assessment.

From the perspective of the cost-effectiveness analysis, the evaluated preventative strategy proved to be a superior alternative to the renal replacement therapies currently applied. Thus, it would be advisable to promote the strategy of preventing transmission of the disease through assisted human reproduction and genetic diagnosis. This would also contribute positively to the economic sustainability of the public health system.

The next section will offer a literature review of those recent works that deal with the main topics derived from the expansion of personalised medicine. The third section will present the ADPKD case-study. The case-study includes the usual sub-sections—first the presentation of the illness, second the methodological aspects, and third the results obtained from the cost-effectiveness analysis carried out. Finally, the conclusions section will address both the issues of the specific case of ADPKD and the more general concern about the advances of personalised medicine.

## 2. Literature review

Healthcare is undergoing a profound revolution as a consequence of three contemporary drivers: systems medicine, big data, and patients' involvement in their own health through social networks. This convergence is leading to a medicine that is predictive, preventive, personalised and participatory (P4)(Hood & Auffray, 2013). Personalised or P4 medicine is personalised, taking into account an individual's genetic profile; predictive, anticipating health problems and drug reactions; preventive, focusing on wellness, not disease; and participatory, empowering patients to take more responsibility for healthcare decisions.

Personalised medicine (PM), sometimes referred to as precision or individualised medicine, is an emerging field of medicine that uses diagnostic tools to identify specific biological markers, often genetic, to help assess which medical treatments and procedures will be the best for each patient. PM has been defined in many instances as "the right treatment for the right person at the right time."

PricewaterhouseCoopers defines personalised medicine broadly, as products and services that leverage the science of genomics and proteomics (directly or indirectly) and capitalise on the trends towards wellness and consumerism to enable tailored approaches to prevention and care. This definition encompasses everything from high-tech diagnostics to low-tech foods and to technologies that enable storage, analysis and linking of patient and scientific data (PWC, 2009).

While the scientific potential of personalised medicine is enormous, delivering a high quality of care will also be a key to the success of this emerging field. Personalised medicine should result in better patient outcomes, not only in how disease is treated, but in how patients are treated as individuals as well.

Patients differ in response to drugs due to differences in genes, environment, and lifestyle. Personalised medicine or precision medicine aims to use the patient's genetic information to fine-tune drug prescriptions, thereby decreasing the risk of ineffective treatment, inappropriate dosing, or side-effects.

Continued advances in genetics, genomics and proteomics have the potential to change medicine dramatically over the next several decades. The challenge is to make it possible to take advantage of the full potential of these new scientific discoveries and improve the health of the population.

With respect to this new P4 medicine, scientific debate is still open on different themes, without having reached conclusive evidence: benefits for patients, biomarkers, immunotherapy, the patient centric model, cost and results per patient, and the co-responsibility of all agents.

- A. Precision Medicine (PM) is essential in increasing the survival and quality of life of cancer patients.

The concept of personalised medicine is not new. The practice of medicine has always been about treating each individual patient, and clinicians have long observed

that different patients respond differently to medical interventions. What is new is that paradigmatic developments in science and technology offer new promise for developing targeted therapeutics as well as tools for predicting who will respond to a medical therapy or who will suffer side effects.

Patients respond differently to the same medicine. The percentage of the patient population for which a particular drug in a class is ineffective ranges, on average, from 38% for anti-depressants to 75% in cancer drugs (Spear, Heath-Chiozzi, & Huff, 2001).

PM promises improved patient outcomes because personal genetic and other specific predictive information allows everyone to become involved in a new treatment paradigm.

The science of genomics and proteomics has the potential to personalise healthcare, enabling providers to match drugs to patients based on their genetic profiles, identify who is susceptible to which health conditions, and determine how a given patient will respond to a particular therapy (a field known as pharmacogenomics). This could eliminate unnecessary treatments, minimise the potential for adverse events, and ultimately, improve patient outcomes.

A number of fields have revealed the benefits of PM in the last ten years. Regarding blood cancers, PM has transformed the understanding of “disease of the blood” into multiple subtypes of leukaemia and lymphomas with a 5-year survival rate of 70% (Jemal et al., 2017). New targeted therapies and immunotherapies – medicines that harness the patient’s immune system to attack cancer cells – are improving survival rates in metastatic melanoma (Flaherty et al., 2012). PM helps predict treatment response in metastatic colorectal cancer (Howlader et al., 2017). Also PM enables targeting of the underlying cause of cystic fibrosis disease (Ramsey et al., 2011).

#### B. The greatest challenge of PM is the development of reliable biomarkers.

The promise of PM is to get the right treatment to the right patient at the right dose the first time, through the use of molecular biomarker tests and targeted therapies. A biomarker is a characteristic that is objectively measured and evaluated as an indicator of normal biologic processes, disease processes, or biological responses to a therapeutic intervention. Biomarkers can be used to reduce uncertainty and guide clinical care.

The success of many personalised medicines fundamentally depends on the identification of biomarkers and the successful development of diagnostic tests that can be used to accurately stratify the patient population.

Researchers have made great progress in identifying genes that, when mutated, drive many cancers. But challenges remain. We now know that cancer is not a single disease, but rather more than 200 unique diseases, many of which are caused by genetic mutations. Identifying these mutations has led to tremendous advances in fighting against many cancers. Nonetheless, the complexity of each disease presents great challenges for researchers, as they explore still unknown alterations. Genomic alterations that drive disease progression remain unknown in around 30% of cases in

common cancers such as colorectal cancer, lung adenocarcinoma, and breast cancer (Garraway, 2013).

- C. Immunotherapy is experiencing a rapid development and representing a new promising modality of targeted treatment.

An important part of the immune system is its ability to distinguish between normal cells in the body and those it sees as “foreign”. This lets the immune system attack the foreign cells while leaving the normal cells alone. To do this, it uses “checkpoints” – molecules on certain immune cells that need to be activated (or inactivated) to start an immune response (Rosenberg, 2014).

The immune system has checkpoint proteins that help keep it from attacking other normal cells in the body. Cancer cells sometimes take advantage of these checkpoints to avoid being attacked by the immune system.

Targeting these checkpoints is quickly becoming an important part of the treatment for some cancers, including melanoma and non-small cell lung cancer. Researchers have also found promising early results against a number of other cancer types. Unlike most other cancer drugs, these checkpoint inhibitors seem to be helpful against many different types of cancer. Thus, drugs that target these checkpoints hold a lot of promise as cancer treatments.

Monoclonal antibodies (mAbs) have already become an important part of the treatment for many cancers. As researchers have learned more about what makes cancer cells different from normal cells, they have developed mAbs to exploit these differences. They have also developed newer forms of mAbs, attaching them to drugs or other substances to make them more powerful (Spitzer et al., 2017).

Only a handful of these treatments have been approved for use so far, but many others are now being studied in clinical trials.

- D. PM requires a reconfiguration of the healthcare structures and a change in the care model.

Personalised medicine not only has the potential to allow patients to receive drugs specific to their individual disease, but also to increase the efficiency of the healthcare system.

In order to promote the development of PM, patients’ attitudes play a key role and the reinforcement of different areas is a prerequisite:

- Protecting, supporting, and informing patients through data confidentiality, non-discrimination, and decision-support.
- Benefiting patients by developing the clinical evidence base to determine which tests work.

- Stimulating future progress by encouraging the development of tests that are proven to work.
- Monitoring care through more transparent coding and reporting.
- Protecting patients by ensuring that lab tests are performed safely and accurately.
- Making it easier for health professionals to stay up-to-date as genetic science evolves.

The published literature on personalised medicine is predominantly focused on patient stratification according to individual biological information. Although these approaches are important, incorporation of environmental factors and patients' preferences in decision-making is also needed. In the near future, personalised medicine should move from treating diseases to managing patients, taking into account all individual factors (Di Paolo, Sarkozy, Ryll, & Siebert, 2017).

Doctors consider the cost and reimbursement for the tests and the lack of familiarity with genetic tests to be the main barriers to incorporating genetic tests in their medical practice (United Health Group, 2012).

Apart from this issue, PM is a disruptive innovation that will require the development of new business models, particularly for health industry players.

The introduction and diffusion of PM should take advantage of some lessons learned from other technologies, such as advanced diagnostic imaging. Nevertheless, some specific issues must be addressed: the need to transition from technology-centred to patient-centred evaluation of medical tests; and the necessity of innovative approaches to evidence development, so as to accelerate the availability of new medical tests and therapies that offer significant advantages to patients and to the sustainability of healthcare systems.

Regarding patient-centred care, a survey of the literature (Kitson, Marshall, Bassett, & Zeitz, 2013) has identified some common core elements in the health policy, medical, and nursing literature. The three main themes that emerged from the analysis were as follows:

- Patient participation and involvement
- The relationship between the patient and the healthcare professional (regardless of professional group)
- The context in which care is delivered

Only a few of the papers reviewed identified access to care and some systemic barriers— including lack of time, staff or equipment— as patient-centred care core concepts.

E. Value-based medicine can contribute to the sustainability of the system.

Apart from helping patients live longer and healthier lives plus creating more efficiency in healthcare, new personalised medicines are providing great benefits to them and the healthcare system.

If personalised medicine succeeds in preventing or successfully treating widespread chronic conditions such as diabetes, the cost savings could be enormous. But this potential has yet to be realised, and many payers (and the employers who pay much of the health insurance tab in the U.S.) are concerned that the high costs of new targeted diagnostics and therapeutics could be unsustainable. They also worry that the costs could be cumulative, given the history of healthcare innovations, which typically supplement rather than replace existing tests or treatments.

For instance, one payer might invest in costly diagnostics and early intervention that might reduce or eliminate the need for surgery in the future. But by then the member may have changed plans, meaning that the new insurer will benefit from the earlier investment.

On a more positive note, personalised medical care has the potential to reduce healthcare costs worldwide and their unsustainable upward climb. Incorporating personalised medicine into the fabric of the healthcare system can assist in resolving many embedded inefficiencies, such as trial-and-error dosing, hospitalisations due to adverse drug reactions, late diagnoses, and reactive treatment.

To illustrate, an economic analysis of the Oncotype Dx® test looked at the real costs of treating women with breast cancer in a health plan with two million members. If half of the 773 eligible patients received the test, then the savings in terms of adjuvant chemotherapy, supportive care, and management of adverse events would be about \$1,930 per patient tested (based on a 34 percent reduction in chemotherapy use) (Genomic Health. Economic validity web site. Available at:

[http://www.genomichealth.com/en-](http://www.genomichealth.com/en-US/sitecore/content/Home/Breast/ManagedCareOrgs/EconomicValidity.aspx)

[US/sitecore/content/Home/Breast/ManagedCareOrgs/EconomicValidity.aspx](http://www.genomichealth.com/en-US/sitecore/content/Home/Breast/ManagedCareOrgs/EconomicValidity.aspx)). Another study found a \$604 million annual savings among all patients when Vectibix® (panitumumab) or Erbitux® (cetuximab) were limited to patients with metastatic colorectal cancer and whose KRAS gene was not mutated (Shankaran V, 2009).

As the cost and duration of genomic sequencing continues on a sharp downward curve, the widely available “\$1,000 genome” is coming (Wetterstrand KA, 2016). This price point is considered a critical benchmark because it is comparable to costs of existing medical tests and procedures. Consequently it could begin to attract a “consumer” market of patients (though the \$1,000 price does not reflect the cost of interpreting genomic data) (Wolinsky H, 2007). Costs have already fallen to the point that full genomic sequencing has been employed in an increasing number of cases to resolve difficult diagnoses, with insurers determining that the approach was cost-effective enough to be reimbursed (Worthey et al., 2011) (Goh et al., 2012).

Personalised medicine offers significant short and long-term benefits, especially in the case of chronic and complex diseases. So, payment and reimbursement policies should not discourage interventions that may raise short-term costs but improve clinical/cost value over time. Policies that recognise the principles of personalised medicine will allow physicians to individualise treatment plans for patients through the early diagnosis of disease, target treatments to optimise clinical outcomes, and prevent unnecessary hospitalisations and care, thus reducing long-term costs (Personalised Medicine Coalition, 2016).

Innovators should be responsible for developing the collective evidence to support the argument that personalised medicine can improve outcomes while controlling costs. Except in the case of some individual products, to date they have not adequately proven that contention.

Since personalised therapies are currently some of the most expensive drugs on the market, PM could appear to be less cost-effective. Because the cost of developing and marketing a biological drug is extremely expensive, this investment seems justified only if the target population for the drug is large enough and if the benefits and gains in 'quality-adjusted life years' (QALY) are sizable. But, by definition, targeted therapies have a small beneficiary population size.

Nevertheless, this perspective reflects a simplistic view. In comparison to personalised drug development, the use of genomic tests to adjust the dosage of an already approved medication or to substitute an approved drug for another seems to be intuitively very cost-effective. Doing so allows for more rational and safer drug use (i.e., less hospitalisation from adverse effects) at little extra cost (Bertier, Carrot-Zhang, Ragoussis, & Joly, 2016).

In terms of economic evaluation, a renewed, more comprehensive approach should be taken when defining intervention endpoints. Standards of excellence such as quality adjusted-life years (QALYs), progression-free survival, and clinical utility must be complemented by other 'real-world' measures that take into account actual patient and clinician experiences with the treatment, as well as more general societal preferences and values. The acceptance of higher costs per QALY and lack of consensus on the incremental cost-effectiveness ratio (ICER) threshold can be viewed as a sign of the limited legitimacy of current health technologies assessment (HTA) approaches. That limitation can lead decision-makers to question, if not, dismiss cost-effectiveness analyses and revert to political or organisational interests (Carrera & IJzerman, 2016). Evaluations of psychosocial and economic costs of adverse effects to therapies need to be included in cost-effectiveness analyses. These renewed endpoints, combined with dynamic reimbursement models, such as reimbursement with evidence collection, could promote an efficient and timely integration of PM into the public healthcare system.

Traditionally, the practice of health technology assessment has been technology centred. Comparative effectiveness analysis addresses alternative strategies to manage a condition, while also considering real-world practice and variations in patient populations. The standards for formulating research questions require that "research proposals and protocols should describe (1) the specific health decision the research is intended to inform; (2) the specific population for whom the health decision is pertinent; and (3) how study results will inform the health decision" (PCORI, 2013).

In a scenario in which personalised medicine occupies a central place, the economic evaluation techniques must be adapted by incorporating into their analytical instruments those aspects that are specific or especially relevant to individualised medicine, especially in oncology and onco-haematology. Incentive systems for innovation and marketing should be redesigned in such a way as to minimise the risks of adverse reactions and to provide real health benefits, at the same time allowing for financial viability of health systems over time (safety, efficacy, and efficiency). In these new circumstances, health outcomes show a clear leadership over all other quality indicators (patient satisfaction, information, wellness, and efficiency).

Regarding the financing of new drugs designed according to the guidelines of PM, economic evaluation is becoming an essential tool in decision-making. A number of countries (Australia, Finland, the United Kingdom, Sweden, Canada, and the Netherlands) are already mandating the economic evaluation of publicly financed medicines and health technologies.

In order to minimise possible biases, intentional or random, in this type of analysis economic evaluations should standardise their methodology, that is, establish precise rules for conducting studies that guarantee the validity of the results and the comparability of the individual studies. In addition to the need for standardisation of the methodology, experts recommend giving greater emphasis to those variables responsible for measuring effectiveness and reflecting the main benefits of PM (Del Llano Señarís, J., Rovira Forns, J., & Albarracín Medina, G., 2009):

- Greater effectiveness per treated individual, as a result of identifying groups of patients in which treatment is more effective.
- Fewer side effects, since the number of treated patients who do not benefit is generally reduced and treatment of patients in whom the side effects are expected to be very serious and will outweigh the expected benefits can be prevented.
- Possibility of improving the evolution of the disease if a genetic test permits the prevention of or early diagnosis of the disease.
- Possible cost savings in the three previous cases.

Precision medicine has emerged amidst the larger context of sustainability of healthcare systems. The affordability of healthcare premiums for employers as well as the affordability of healthcare costs to families is the conundrum of the sustainability of biomedical innovation. Targeted therapies and companion diagnostics, by better selecting patients and treatments, can improve effectiveness and reduce harm plus costs of treating patients who do not respond to or are adversely affected by a therapy. In doing so, targeted therapies are expected to conserve costs and resources. However, more narrowly defining appropriate patients for a therapy also confines the potential market for that therapy (Aronson, 2015).

In summary, PM complicates the traditional economic evaluation analysis due to the combined nature of molecular tests and targeted treatments. It increases the complexity and uncertainty of analyses, and the heterogeneity in value, particularly across different types and stages of cancer (Doble, 2016). Thus, PM not only accentuates doubts regarding the financial capacity of States to finance medical innovations, but also obliges the rethinking of various unclosed debates about health policy decisions, such as the opportunity cost of resources, the value of diagnostic tests, and the value of patients' preferences over that of public preferences. In addition to analytical and clinical validity, stakeholders in personalised medicine are also interested in knowing the clinical utility of new diagnostics. Clinical utility is a term that describes the relevance and usefulness of an intervention in patient care. In other words, it asks the question: how much value does it add?

The main problem that persists nowadays is that the prices of many medicines, especially anticancer drugs, are excessively high, and current pricing trends are unsustainable. Anticancer drug pricing affects patients and payers globally. Given the com-



plexity of this topic and its broad origins, no single solution will suffice. Reducing the price of anticancer drugs will likely reduce the profit margins of most major biopharmaceutical firms from their current levels. Some experts believe that doing so will curb the development of innovative new drugs. Others argue that reducing prices might even encourage innovation. A recent literature search was unable to identify empirical evidence on this topic in either direction. Therefore, policy makers should evaluate the effects of pricing policies on both affordability and access to anticancer drugs, as well as on the anticancer drug-development pipeline (Prasad, Jesús, & Mailankody, 2017).

- F. In value-based medicine, co-responsibility of all agents is crucial –patients, their environment, and health providers.

Partnerships are crucial to maintaining robust biopharmaceutical innovation. Collaborations come in many different shapes and sizes. These are some selected examples of key collaborative efforts across the research and development spectrum in the USA:

- AMP (Accelerating Medicines Partnership): Developing new diagnostics and biological targets for treatments in Alzheimer's disease, type 2 diabetes, rheumatoid arthritis, and lupus. The Partners: biopharmaceutical companies, NIH, patient and disease organisations (<http://nih.gov/science/amp/index.htm>).
- Biomarkers Consortium: Combining expertise and resources to rapidly identify, develop, and qualify biomarkers, which will then advance new therapies and guide improvements in regulatory and clinical decision-making. The Partners: biopharmaceutical companies, NIH, CMS, FDA, patient and disease organisations (<http://www.biomarkersconsortium.org/index.php>).
- Lung-MAP (Lung Cancer Master Protocol): Using comprehensive genetic screening to identify mutations in lung cancer patients in order to direct them to a specific investigational treatment, all operating under a single clinical trial protocol. The Partners: biopharmaceutical companies, NIH, FDA, patient and disease organisations (<http://www.lung-map.org/>).

The Innovative Medicines Initiative (IMI) is Europe's largest public-private initiative, aiming to speed up the development of better and safer medicines for patients. IMI supports collaborative research projects and builds networks of industrial and academic experts so as to boost pharmaceutical innovation in Europe.

The Innovative Medicines Initiative (IMI) is working to improve health by speeding up the development of, and patient access to, innovative medicines, particularly in areas where there is an unmet medical or social need. It does this by facilitating collaboration between the key players involved in healthcare research, including universities, the pharmaceutical and other industries, small and medium-sized enterprises (SMEs), patient organisations, and medicine regulators. IMI is a partnership between the European Union (represented by the European Commission) and the European

pharmaceutical industry (represented by EFPIA, the European Federation of Pharmaceutical Industries and Associations).

In Spain, the Senate, on March 8, 2017, approved the motion by which it agreed to create a working group on genomics, with the following text: “The Senate will create a genomics study group to analyse the regulatory, ethical, and organisational implications of the application of genomics, genetic engineering, predictive medicine, and precision medicine.” The objective is the development of a strategy that allows an effective, ethical, and equitable response to the social and health challenges of personalised medicine.

### **3. Case-study: The prevention of ADPKD**

#### **3.1. Description**

Autosomal Dominant Polycystic Kidney Disease (ADPKD) is the most common hereditary kidney disease, of which the main symptoms are the appearance and progressive growth of renal cysts (Alianza frente a la Poliquistosis Renal & Autosómica Dominante (PQRAD), 2016). Currently we do not have any curative treatment for this illness, which in most cases provokes renal failure and the necessity of renal replacement therapy (RRT), dialysis or kidney transplant. It represents the sixth cause of chronic kidney disease and is an illness that affects hundreds of thousands of people in Europe (European ADPKD Forum, 2015). One out of every ten people needing dialysis or transplantation suffers from this illness which amounts to about 50,000 people in Europe. It is inherited in an autosomal dominant manner with complete penetrance. This means that clinical symptoms are present in all individuals who have the disease-causing mutation. Hence, a child has a one in two (50%) chance of developing ADPKD if one of the parents has the faulty PKD1 or PKD2 gene (Irazabal MV & Torres VF, 2011).

From the patients' perspective, ADPKD has physical and psychological effects throughout their lives that severely limit wellbeing, as well as interfering with normal daily and work activities (Miskulin et al., 2014) (Rebollo-Rubio, Morales-Asencio, Pons-Raventos, & Mansilla-Francisco, 2015). Pain is the symptom most closely associated with diminished quality of life. Overall survival evaluated for patients in dialysis is 12.9% after ten years of treatment (Ministerio de Sanidad Servicios Sociales e Igualdad. Consejerías de Sanidad de las CCAA, 2015).

As a consequence of the constant ambulatory visits and hospitalisations required, patients with ADPKD generate substantial health costs for the national health systems during their entire lives. ADPKD costs increase significantly when patients need RRT, dialysis or transplantation. In Europe, one out of ten patients with ADPKD needs these treatments with an approximate cost of 1,500 million EUR per year.

ADPKD experts have recently recommended that preimplantation genetic diagnosis (PGD) should be available to all patients. However, PGD is a highly specialised tech-

nique requiring multidisciplinary collaboration. Access to PGD varies widely between European countries, in terms of both its availability and reimbursement. Financial pressures could be an important barrier in some countries, even though in principle PGD may be cost-saving to society by preventing ADPKD in the offspring of affected patients. Other barriers may include low awareness of the method among patients along with personal values among nephrologists and patients. When PGD is offered, genetic counselling and careful pre-conception assessment should be an integral part of the process (European ADPKD Forum, 2015).

The current challenges in the area of ADPKD include lack of interest among healthcare stakeholders, the need for multidisciplinary teams, and the absence of approved treatments. In this sense, the Andalusian Parliament initiative with the ADPKD primary prevention plan could be considered a significant milestone from the healthcare point of view. This plan should be assessed through the criteria of economic evaluation— the instrument to appraise the allocation of healthcare resources and the impact of health policy decisions on economic sustainability of the public health system.

On September 29th, 2016, the Health Commission of the Andalusian Parliament (BOPA 337 on November 7th, 2016) approved the legislative proposition (10-16/PNLC-000248) related to the creation of the Primary Preventative Plan for Autosomal Dominant Polycystic Kidney Disease (ADPKD). Point 5 of the Plan recommends that the Andalusian Regional Government should amplify and improve the options for human reproduction to prevent transmission of the illness. In this regard, preimplantation genetic diagnosis (PGD) is one of the most effective procedures.

The objective of this case study is to compare two healthcare strategies for the treatment of ADPKD. The classic scenario is based on symptomatic treatment plus RRT, and the alternative strategy is based on the prevention of new cases by means of human reproduction techniques plus preimplantation genetic diagnosis.

### **3.2. Methods**

Cost-effectiveness analysis is the methodology utilised. This methodology was used to assess a preventative healthcare intervention where the effectiveness measurement variable was the number of healthy children born of affected parents. Results, presented in monetary terms, will evaluate the cost of RRT in two different scenarios for patients needing this treatment, during a 66-year period.

The cost analysis includes direct costs linked to RRT, assisted reproduction with the specific technique of IVF plus intracytoplasmic injection (ICSI), preimplantation diagnosis and genetic studies for mutations in PKD1 and PKD2 for patients with ADPKD.

The cost-of-illness was calculated with data from a registry of ADPKD patients in Granada starting in 2004. The registry currently has 1,136 patients, although this study only took into account those cases in which patients died, and where the registry had full information about the beginning and end of each modality of RRT up to the moment of death.

The sample includes information about 212 patients, of whom 143 needed RRT.

The average cost calculated only includes costs generated in the more advanced stages of illness when patients need dialysis or transplantation. Neither external consultations in primary care centres nor hospital consultations were considered. Costs of emergency episodes and hospitalisations were not included either in the study. Annual costs published in the specialised literature per patient per year, 44,778.08 EUR for dialysis, 34,554.10 EUR for peritoneal dialysis (Sergio Márquez-Peláez et al., 2013), 47,136.33 EUR during the first year for renal transplantation, and 6,477.00 EUR (Arrieta, 2010) for successive years following transplantation were applied for the specific time periods throughout the course of illness for each patient.

Since both strategies have their own costs in very distinct time periods, a 3% discount rate was applied to calculate the current value, thus allowing us to compare both monetary flows.

With regard to the reproductive strategy, the option chosen was the elective transfer of a single fresh embryo plus two additional attempts with frozen ones, in case the pregnancy was not achieved or was not carried to term after the fresh embryo transfer. The expected live-birth rate was 25% for fresh embryo transfer and 20% for transfers after cryopreservation (Hernandez Torres et al., 2015).

To compare both strategies the cost of two simulated scenarios was calculated. One hundred couples with genetic mutations were included in each alternative sample. Finally, differences between cost and effectiveness were contrasted by means of the incremental cost-effectiveness ratio (ICER).

A sensitivity analysis was carried out for the variable number transfers. This analysis considers only two transfer attempts, the first with a fresh embryo and the second with a cryopreserved embryo.

### 3.3. Results

The average calculated cost for an ADPKD patient throughout the course of illness was 170,800.54 EUR. This expense reached 253,214.79 EUR for those patients of the sample who required RRT and zero cost for the rest.

The results for the simulated scenarios for both alternatives are exhibited in Table 1.

	No. Cases	AR Transf.	Children born	Situation	Treatment	Unit Cost	Total Cost	Period of costs	Present Value	Cost-Effectiveness Ratio
Current Strategy	100	-	50	Sanos		- €				
		-	50	PQRAD	TRS	170,800.54 €	8,540,027.00 €	58 a 66	1,370,299.19 €	
			50				8,540,027.00 €		1,370,299.19 €	27,405.98 €
Preventative Strategy	100									
		1	25	Sanos		5,520.00 €	138,000.00 €	1	138,000.00 €	
		1	75	No embarazo		5,520.00 €	414,000.00 €	1	414,000.00 €	
		2	15	Sanos		500.00 €	7,500.00 €	1	7,500.00 €	
		2	60	No embarazo		500.00 €	30,000.00 €	1	30,000.00 €	
		3	12	Sanos		500.00 €	6,000.00 €	1	6,000.00 €	
		3	48	No embarazo		500.00 €	24,000.00 €	1	24,000.00 €	
		-	24	Sanos		- €	- €			
		-	24	PQRAD	TRS	170,800.54 €	4,099,212.96 €	58 a 66	657,743.61 €	
		76				4,718,712.96 €		1,277,243.61 €	16,805.84 €	

Table 1: Cost-Effectiveness Analysis

The difference in terms of effectiveness was 26 additional children who were born free of the illness in the preventative strategy. The present value per healthy child in the preventative strategy was 16,805.84 EUR contrasted with 27,405.98 EUR in the current procedure. In global terms, the preventative strategy implies a saving of 93,055.58 EUR. Accordingly, the resulting ICER was -3,579.06 EUR. So, the preventative strategy can be regarded as a dominant strategy that is more effective and less costly.

The sensitivity analysis with two transfers of a single embryo also offers a favourable cost-effectiveness ratio for the preventative strategy. In this case, the ICER is positive but it does not even amount to 2,000 EUR per healthy child.

Cost-effectiveness analyses assess usually costs and effectiveness obtaining these values from the specific National Health Service in which they are informing a health policy decision. Although the objective of this case-study is not to offer an international comparison of all the variables intervening in costs or outcomes, transferability of results is a necessary issue to deal with. The results obtained in this analysis are fully transferable to the countries of the European Union. Although the reimbursements paid in different European countries for home dialysis are not exactly the same, the average figure is 46,280 US\$ a year, which represents annual figures very close to those used in this study (Vanholder et al., 2012). A different data source, the European Renal Association-European Dialysis and Transplant Association (ERA-EDTA) Registry (Spithoven et al., 2014) gives costs of RRT higher than ours in the study: Haemodialysis (53,089 EUR), peritoneal dialysis (38,734 EUR), transplantation 1st year (51,264 EUR), and transplantation follow-up (11,877 EUR). Epidemiological data regarding the age of patients when they need RRT and the average age of death are also in consonance with European publications.

## 4. Conclusions

Although this analysis focused on the cost of patients with ADPKD, it should be noted that the preventive strategy with three embryo transfers after an IVF-ICSI cycle reduces the transmission of the disease by 52%. This reduction also implies an extraordinary gain both in life expectancy and in quality of life for those children born without the disease

Regarding the effectiveness of PGD, in 2004 the literature recorded the first case of twins born free of the disease using this technique (Verlinsky et al., 2004). The Granada team, in collaboration with other centres, also achieved the birth of a child free from the disease four years ago.

In conclusion, this work offers solid support to the Primary Prevention Plan of the ADPKD approved by the Andalusian Parliament, not only for the assured clinical benefits it will promise for the families affected, but also for its demonstrated contribution to the economic sustainability of the public healthcare system. Consequently,

governments are encouraged to formulate national policies on PGD in ADPKD as well as other conditions, together with practice guidelines.

Although this study was carried out with patients from the Granada registry, the most relevant epidemiological data for the cost-effectiveness analysis (the age of patients when they started RRT and the average age of death) are very similar to those published in the literature, both in Spain and in Europe. This concurrence allows for it to be reasonably assumed that the results can be generalised to other geographic and functional environments.

Regarding the relevance of PM development, cancer is a crucial field. In Spain, 5% of total health expenditure corresponds to oncology. Precision medicine has appeared as the only way to respond to the challenges of oncology, since it can readily deal with the different faces that cancer shows, not only between different patients, but in the same patient at different times. But the contribution of clinicians alone is not enough. Precision medicine requires a political approach as well.

The necessary changes involve different factors. One of the most important is the possibility of individualising the treatment, as knowledge about biomarkers advances. Biomarkers permit us to reshape the way in which cancer therapies are being developed, thus facilitating faster, more efficient and cheaper drug development. Other necessary development lines are related to the incorporation of innovative payment formulas (pay-for-value) and the momentum of networking, which will allow for sufficient sample sizes with lower costs.

Although the development of personalised medicine (PM) has been remarkable during recent decades, its immediate future still faces many challenges that must be adequately managed, such as limited understanding of the intrinsic biology of disease, common conditions involving multiple genes/biomarkers, an outdated disease classification system, lack of infrastructure, clinical implementation of new diagnostics, investment uncertainties, and access to personalised therapeutics.

From discovery through delivery of treatment, policies must foster continued innovation and patient access to PM. Two strategic points within policy solutions must be to advance research on molecular-based biomarkers so as to support the development of targeted therapeutics and molecular diagnostics and to develop the framework for incorporation of larger and more diverse data sets (real world data, patient-centred outcomes, biomarkers, etc.).

Personalised medicine's advocates comprise representatives from every corner of the healthcare system, including clinicians, providers, insurers, industry, the patient advocacy community, and academia. The advance of PM on the right course depends on all these agents. Regulatory authorities must establish a clear set of guidelines for evaluating and approving personalised drugs and, significantly, the diagnostics that identify patients who can benefit from them. Payers should institute a path towards assessing the clinical and economic utility of personalised medicine practices in order to facilitate their reimbursement. Healthcare delivery organisations must successfully integrate personalised medicine into clinical practice. Patients need to participate in their own healthcare choices, taking an active role in expressing their concerns about data sharing and access to personalised treatments. Finally, health information systems must incorporate features that support 21st century medicine—features that provide the ability to collect and analyse data from everyday clinical en-

counters and help physicians make decisions based on the vast amount of information linking genetic patterns to diseases and their treatment.

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# HUMAN RIGHTS IN MULTINATIONAL ENTERPRISES ACCORDING TO THEIR SUSTAINABILITY REPORTS

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## 1. Abstract

*In this paper, we analyse the evolution of the main indicators of Sustainability Reports registered in the Global Reporting Initiative (GRI), for Multinational Enterprises, especially those indicators relating to Human Rights. Through descriptive and predictive statistical techniques, such as decision trees, we have obtained evidence that the development of sustainability reporting has increased during the recent economic crisis. It is also noteworthy that the best predictors by preparation of sustainability reports with these indicators, belong to certain regions, such as Europe and Asia. This is followed by the sectors, most notably Transport, Waste Management, Water Utilities, Education, Health, New Technologies related to Renewable Energy, and other sectors such as Agriculture, Construction, Energy or Infrastructure. Our models also predict that global likelihood that in these reports an express declaration of accession to the UN Global Compact is included, is 38%; 14% for OECD standards for Multinational Enterprises, and 15% in ISAE 3000 certification.*

## 2. Introduction

A formal definition of Corporate Social Responsibility (CSR) is the following: A set of obligations and commitments, legal and ethical, national and international, along with interest groups, arising from the impacts of the activities and operations of organisations, results in social, occupational, environmental and human rights. That is, CSR affects the very management of organisations, both in their productive and commercial activities, and in their relationships with interest groups (stakeholders). It influences all types of organisations, public or private or non-profit, in all their dimensions and performance as well.

Consequently, issues related to CSR would be sustainable development, management of economic, environmental and social impacts of business operations and underwriting profitability, not only for shareholders but also for other interested parties whom the company's activity affects.

Focusing on the aspect of Human Rights, the international regulations that companies should consider for their protection in their area of influence, are based on the recognised principles contained in the United Nations Universal Declaration of Human Rights (1948). These would be a form of Global Public Good, which in turn includes

others such as freedom, security, health or the environment, which have evolved throughout the twentieth century. They would be the basis of international consensus, on which few currents of economic thought have questioned their respect.

In the era of globalisation, companies in general, and especially multinational enterprises, have an important role to play in having a decisive influence on the enjoyment and exercising of human rights. Therefore, businesses have a responsibility for Human Rights, as a legal subject, like States, and their management can either protect or violate these rights.

The added problem is that the context of globalization has caused a kind of "social dumping", based on infringements of human rights, because the global market is not regulated or supervised. Thus, these "Free Rider" businesses exploit loopholes left by globalisation, in order to obtain comparative advantages, being accomplices to, or taking advantage of, the violation of human rights through their business. Therefore, international organisations, like the UN, have been promoting standards for transnational corporations and other business enterprises.

In this regard, in 1997, the United Nations Sub-Commission for the Promotion and Protection of Human Rights prepared a study on the relationship between business and human rights. The following year a resolution was adopted to study the activity and working methods of transnational corporations. Four years later, the group submitted a draft of the UN Norms for Business, which was adopted unanimously in August 2003. In 2005, the Commission on Human Rights adopted resolution 2005/69 in which it invited the UN Secretary General Kofi Annan to appoint a special rapporteur. He appointed Mr. John Gerard Ruggie, a professor at Harvard University, to study the issue of transnational corporations and act as his personal advisor in the Global Compact.

Although the Norms of the Responsibilities of Transnational Corporations and Other Business Enterprises with Regard to Human Rights are not strictly rules, they are an important step towards the goal of achieving a regulatory text detailing the main human rights obligations of companies, based on international standards.

Among the Rules, Standards and Certifications related to the social dimension of Corporate Social Responsibility, are the following:

- UN Norms for Transnational Corporations, cited above.
- OECD guidelines for multinational companies, which are actually a Code of Conduct, consisting of a set of voluntary principles and standards adopted by some governments, to which transnational corporations are expected to adhere.
- The United Nations Global Compact, which is another Code of Conduct. It is a voluntary initiative for companies and civil society and labour organisations, aimed at integrating the strategy of the signatories to the Compact. It contains ten principles of conduct related to Human Rights, Labour, Environment and the fight against corruption.

- Management System Certification and SA8000 is a voluntary standard that specifies a number of criteria associated with the concept of Corporate Social Responsibility in the area of working conditions.

One of the most important initiatives for sustainability has been the Global Reporting Initiative (GRI). The American Coalition for Environmentally Responsible Economies (CERES), along with the Programme of the United Nations for the Environment (UNEP), created this project. GRI began in 1997, published the first guide in 1999 and the final version in 2000 ([www.globalreporting.org](http://www.globalreporting.org)).

GRI is a process multistakeholder. It is an independent institution whose mission is to develop guidelines and disseminate globally applicable sustainability. These Guidelines are for voluntary use by an organisation when preparing a report on the economic, environmental, and social dimensions of its activities, products, and services. It is the main international standard report for the development of CSR or sustainability. The philosophy underlying this information tool is the triple account of results or Triple Bottom Line, to use the English terminology. This involves talking about sustainability.

In this research we have accessed the sustainability reports database published by the GRI from 1999 to 2015, and we have analysed the main indicators contained therein.

### 3. Background

In this paper we analyse responsible management policies from different Multinational Enterprise from all the sectors. This analysis will be undertaken utilising the main indicators of Human Rights registered by sustainability reports of GRI.

Therefore, our main working objective will be:

1) Obtain evidence that the economic crisis has had a positive effect on the development of sustainability reporting in the Multinational Enterprise (ME).

2) Analyse the content of the main indicators of the sustainability reports of the GRI database to verify that multinational companies presenting sustainability reports are increasingly adhering to standards and codes of conduct of respect for Human Rights.

3) Check if the predictors of such behavior include the economic sectors most involved in green investments to prevent climate change; the regions of greater economic development and therefore greater responsibility in CO<sub>2</sub> emissions into the atmosphere; and finally, the period closest to the economic crisis.

### 4. Methodology

On the one hand we carry out a review of the literature analysing the advantages and disadvantages of CSR and the benefits for businesses of implementing sustainable management.

On the other hand, we analyse the evolution of the main indicators of Sustainability Reports registered in GRI, to compare the relationship between the different indicators through descriptive statistical techniques, and some predictive techniques, such as decision trees.

Decision trees are predictive models to solve problems of discrimination in a population segmented to finally obtain a reliable classification into homogeneous groups, according to the variable interest (Perez, 2016: 599).

They are predictive models because the segmentation of the population is made according to the values of the variable of interest, that playing the role of the dependent variable in the predictive model in the tree (qualitative variable). The assignment of a population to a segment element is performed according to the values of the independent variables of the model.

Therefore, the explanatory variables selected are those that are more discriminants for the dependent variable and a decision rule is constructed for allocating a new individual or class to a value of the dependent variable.

However, this method does not consider simultaneously the set of explanatory variables, because it examines them one by one, looking first at the  $x_j$  variable that best explains the dependent variable  $y$ . This would define a first division of the sample into two subsets called segments. The process is then repeated in each of the two segment, looking at the second explanatory variable, and so on until the process ends with a previously established statistical norm.

In our case we will try to determine what kind of Human Rights indicators have been more likely to be carried out by Multinational Enterprises. The first selection could be done by Multinational Enterprise type. A second selection could be done by the years of publication. A third by the region of the company and finally by economic sector. This technique is intended to apply to each of the main indicators that represent the human rights of the sustainability reports. Prior to this, a descriptive analysis will be conducted in which the global evolution of report preparation under the GRI methodology, for each of the main indicators contained in the GRI database, is displayed.

One way to classify Human Rights is by generations, grouped according to their nature and legal recognition, but some take precedence over others. Thus, the first generation rights are referred to as civil and political rights, which led the major revolutionary movements in the eighteenth century. Second generation are the economic, social and cultural rights, which promoted the Social and Law State. The third generation would be called "Solidarity Rights". These encourage social progress and the standard of living of the population. They are related to the healthy environment, the right to a life of dignity, peace and the self-determination of peoples. The fourth generation are generated from scientific and technological development. Therefore, everything related to the environment, climate change or the deterioration of population health as a result thereof, are also related to Human Rights. Corporate Social Responsibility reports are therefore related to all these aspects.

Focusing on the content of sustainability reports prepared by the GRI methodology, the analysis has three areas: GRI Index and profile, GRI Principles and GRI Indicators (GRI, 2002-2016).



In the first two, GRI Index and profile and GRI Principles, we evaluate the quality of information provided on CSR management systems in the enterprise. In the final GRI Indicators, we evaluate the quality of content in terms of CSR provided in the documents examined.

The Global Reporting Initiative indicators are: Economic performance (customers, suppliers, etc.), Environmental performance (raw materials, energy, water, biodiversity, etc.), Social performance (labour practices), Social performance (human rights), Social performance (society) , Social performance (product liability).

The Global Reporting Initiative principles are: Transparency, Inclusiveness, Auditability, Completeness, Relevance, Sustainability Context, Accuracy, Neutrality, Comparability, Quality and Periodicity.

There's a old debate, even today, regarding the requirement that companies generate mandatorily sustainability reports. The results of the second global survey on attitudes of stakeholders to the information CSR (Pleon, 2005), shows that more than 60% of the sample believed it would be good that CSR was incorporated into the annual financial reports, among other reasons for this would imply recognition of the importance of social and environmental aspects for the company, and forcing to report on these aspects to companies that otherwise would not.

Aragón-Correa et all (2016) compared the individual corporate environmental performance and disclosure of the 100 most international non-financial firms in the world, to those of 16,023 firms in their industries and a group of selected firms similar to those in the group of the 100 most international in our sample. Theirs results show that although the top international firms have a much better record of environmental disclosure than the firms within their industries and the matched pairs, the top international firms actually show worse environmental performance than their peers. The results suggest that the top international firms seek legitimation for their environmental activities by means of voluntary disclosure.

For a sustainability report to be useful to all potential users, the information collected must meet the requirements of relevance, reliability and verifiability. It is also important that the information collected is relevant in social and environmental terms and accessible to potential readers.

The importance of the GRI sustainability report is that it is an international voluntary standard, which provides information on the economic, environmental and social dimensions of companies activities. In its development, the most demanding level is the "A +", which rests on transparency and third party verification, in order to balance flexibility in developing and achieving greater comparability among informants. All these requirements are those positively valued by the different stakeholders in the Pleon 2005 survey. In this survey 65% felt it was a step towards standardisation in order to provide comparability, in addition to its flexibility (57.8%) and the possibility of use as a benchmarking tool (49%).

## 5. Results

### 5.1. The main indicators of Sustainability Reports registered in the GRI.

The main indicators contained in the GRI sustainability reports database, related to the objectives of this work, are:

**United Nations Global Compact Code of Conduct (UNGC).** The United Nations Global Compact, or the Global Compact, is a voluntary initiative of ethical commitment for companies and civil society and labour organisations, aimed at integrating the strategy of the signatories to the Compact. It contains ten principles of conduct related to Human Rights, Labour, Environment and the fight against corruption. It originates from an initiative of UN Secretary General Kofi Annan during the World Economic Forum in Davos in January 1999.

**Codes of Conduct for Multinational Enterprises OECD.** They are a set of voluntary principles and standards for companies adopted by some governments, to which multinational companies are expected to adhere.

The intent of these rules is to ensure that company activities are in harmony with government policies, strengthen the mutual bond between enterprises and the societies in which they operate, improve the climate for foreign investment and contribute to the enhancement of sustainable development.

Included among the main principles and basic commitments are contributing to sustainable development, respecting the human rights of those affected by their activities, encouraging local capacity, promoting the training of local human capital, refraining from seeking or accepting exemptions not covered by the legal framework of the country, supporting and upholding good corporate governance principles and best practices, promoting employee awareness of company policies and compliance with them, refraining from discriminatory or disciplinary action against employees who act in good faith, encouraging business partners to apply principles of corporate conduct compatible with the Guidelines and refraining from any improper involvement in local political activities.

**Management System Certification SA8000.** This is a voluntary standard that specifies a number of criteria associated with the concept of social responsibility of companies in the area of working conditions. It was developed by a group of experts in 1997, convened by the Council on Economic Priorities Accreditation Agency, CEPAA. It's being directed from 1998 by Social Accountability International (SAI).

Its various clauses are based on the Universal Declaration of Human Rights, the UN Convention on the Rights of the Child, and on a series of Conventions and Recommendations of the International Labour Organization (ILO).

This regulation is related to issues such as child labour, forced labour, Health and Safety at Work, Freedom of Association and Collective Bargaining, Discrimination, Discipline, Working Hours and Compensation.

In the data base of GRI appears ISAE3000, that Indicates application of the International Standard on Assurance Engagements ISAE3000 as disclosed in the external assurance statement.

## **5.2. Descriptive analyses of the main indicators of Sustainability Reports registered in the GRI.**

In Table 1 and 2 we present the sustainability reports from the GRI database by sector and years of publication. They have also been divided into different ranges in order to clearly visualise the effects before and during the current financial crisis. As can be seen from this table, and also by the accompanying Figure 1, the highest percentages of growth in sustainability reports are produced from 2013, almost doubling all previous periods, in almost all sectors, although, in general, the increase was evident despite the aforementioned crisis. The GRI database, contains 32,183 reports spread across 38 sectors over 16 years, in the five continents of the world (8,243 Multinational Enterprises).

In Table 3, this division is made by economic sector. Many MNE belong to the sector of Transport, Waste Management, Water Utilities, Education, Health, New Technologies related to Renewable Energy. Others, such as Agriculture, Construction, Energy or Infrastructure, are included in our third objective. These are the economic sectors most involved in plans for green investments to prevent climate change in the coming years. All the MNE show a strong increase in production sustainability reports from 2011 onwards.

In Table 4, this division is made by regions. In the case of Multinational Enterprises (MNE), with the largest production of sustainability reports in Europe since 2011, followed by Asia, North America, Latin America and the Caribbean. Oceania and Africa

In all the cases a significant increase in the production of sustainability reports was observed in the middle years of the current financial crisis.

## **5.3. Predictive analyses of the main indicators of Sustainability Reports registered in GRI, through the statistical technique of decision trees.**

In the first group of decision trees, UNGC is used as the dependent variable. All of the information related data points are taken from the available assurance statement found in the Report. As independent variables we use the variables: region, sector and ranges (publication period) (Tree 1).

The predicted probability that sustainability reports in MNE have been prepared using the United Nations Global Compact Code of Conduct (UNGC) is 38% (Graph 2). The regions are the best predictor. The 36.6 % of sustainability reports in Europe were prepared using the UNGC; 26.2% in Asia; 17.7% in Northern America and Oceania; 50.4% in Latin America & the Caribbean and 11.3% in Africa. The next predictor is the sector, followed the year of publication of reports. Of these, over 50% were made from the middle years of the financial crisis 2011-2012

When used as dependent variables the OECD code (Tree 2), the probability Predicted that sustainability reports have been elaborated with this code, is 14% (Graph 3). The best predictor in this code, also is the region. The first group is Latin America & the Caribbean, and Asia, with only the 3.8%, followed of Europe With the 10.9%. With the 4.5% Northern America and Africa, and Oceania with the 18.3%. The Next predictor would be the years of its reporting in all regions. In the intervening years, in all cases the most important periods starting in 2012. In terms of sectors, the sectors of transport and treatment of wastewater, water Utilities, and healthcare Product, are the most significant.

When used as independent variables the Management System Certification ISAE3000 (tree 3), the probability Predicted that sustainability reports have been elaborated with this code, is 15% (Graph 4). Also In This case the regions are the Most Important predictors, followed by the sector in the first group (Europe, Latin America and Oceania), and for the publication year in Asia and Africa. With regard to sectors, would emphasize the sectors of Construction, Energy, Healthcare Products, and Universities.

## 6. Discussion and Implications

A clear asymmetry currently exists between International Human Rights Law and work and International Commercial Law. In the same vein, many companies defend the national sovereignty of different states when referring to the human, employment and environmental rights of citizens, but justify the interference and transfer of sovereignty of institutions such as the International Monetary Fund, the World Bank and the World Trade Organisation (Maira V, MM, 2015:63).

Shaw and Hale (2002) demonstrate that, frequently, codes and reports are systematically not met, without being verified by audit companies, trade unions or social organisations. Kwan and Frost (2002), analysed two organisations, the Asia Monitor Resource Center (AMRC) and the Hong Kong Christian Industrial Committee (HKCIC), and concluded that the codes of conduct of companies such as Disney and McDonald's are unknown in their value chains in China.

In the same way, the independence of entities of social authority and certification is on occasion questioned, given that many of them receive funds from, or are sponsored by, companies. For private audit companies the RSE is a business.

For example, the SA 8000 certificate of Social Accountability International (SAI), receives funds from the Ford, Rockefeller and MacArthur Foundations (Shamir, 2007; Hernández and Zubizarreta, 2009).

In general, it seems that there is a substantial distance between what multinational companies say and what they actually do (Ireland and Pillay, 2010). Companies avoid the regulations thanks to the position of power that they hold and the consolidation of a series of myths that hide the conflicts between work and capital, in addition to other social conflicts (Maira, V. MM., 2015: 102-103). In any event, that strategy is not established by a rational calculation, but rather from practical considerations and the prevailing logic in the field of analysis (Bourdieu, 2007).

However, the evidence obtained by this research confirms an increase in the preparation of sustainability reports by multinational companies, a fairly significant probability percentage of which also comply with the most important standards and international codes in relation to Human Rights. The regions with greater economic activity (Europe and Asia) also stand out, together with the sectors that will see the largest investments in Research and Development to curb climate change over the coming years.

## **7. Conclusions**

One way to classify Human Rights is by generations, grouped according to their nature and legal recognition, but some take precedence over others. The third generation are related to the healthy environment, the right to a life of dignity, peace and the self-determination of peoples. Therefore, everything related to the environment, climate change or the deterioration of population health as a result thereof, are also related to Human Rights. Corporate Social Responsibility reports are therefore related to all these aspects.

Through the bibliographical analysis, we have accessed important studies by different specialists, and reports from international organisations, which confirmed that the increased attention to environmental issues is the result of decades of work and the promotion of sustainable development by international organisations such as the United Nations (UN) and the World Bank.

It can also be confirmed that climate change and economic development are causing major health problems in the population. In fact, some studies show that emissions of greenhouse gases into the atmosphere are causing a significant increase in mortality in the world, and that many of these changes are already having a greater effect in the more developed societies and countries. This could be considered a "boomerang effect" of uncontrolled economic development.

All this has led international organisations to promote what is called "green investments", which are those needed to reduce greenhouse gases, without reducing the production and consumption of non-energy goods. In this global shift towards sustainability some sectors are better suited to this type of investment than others.

These sectors are Agriculture, Transport, Water, Energy and Forestry, where increasing annual investments of more than \$ 5 billion a year are planned until 2020.

Therefore, the three main research objectives of this paper, detailed above, are confirmed. On the one hand, evidence has been obtained that the economic crisis has had a positive effect on the development of sustainability reporting in Multinational Enterprises. An increase in the number of companies producing reports began in 2011 and doubled from 2013, when signs of overcoming the current economic crisis began to appear in some parts of the world.

At the same time, many multinational companies that produce GRI sustainability reports, also adhere to other codes of conduct; the UN Global Compact, the OECD standards for multinationals, and the ISAE3000 certification standard; which represents a reinforcement of their behaviour in favour of respecting human rights. The odds of including these quality standards in the management of the company, vary between 15% for the ISAE3000, 14% for the OCDE standars for Multinational Enterprises, and 38% for the GC.

Likewise, our research also confirmed that Europe and Asia are the best predictors in the development of the sustainability reporting of these quality standards of respect for human rights. It is notable that North America, one of the regions worst polluters on the planet and the most influential in the world economy, does not figure as an important predictor for these purposes.

## 8. Future Research

Two complementary lines of potential future research arise from this paper. On the one hand, would be looking at the global impact on the world economy of those multinational companies where an increase in sustainability reporting, and a greater compliance with the standards and codes of respect for Human Rights, have been detected. This would enable us to have a clear idea as to whether said change is truly significant or not.

On the other, it would be necessary to take a representative sample, by region and economic sector, of the multinational companies that meet the above criteria, in order to access their sustainability reports, and the information about their activity published in other databases. This would enable more conclusive evidence to be obtained, concerning the veracity of their declarations in respect of Human Rights compliance in their entire value chain.

## 9. Tables and figures

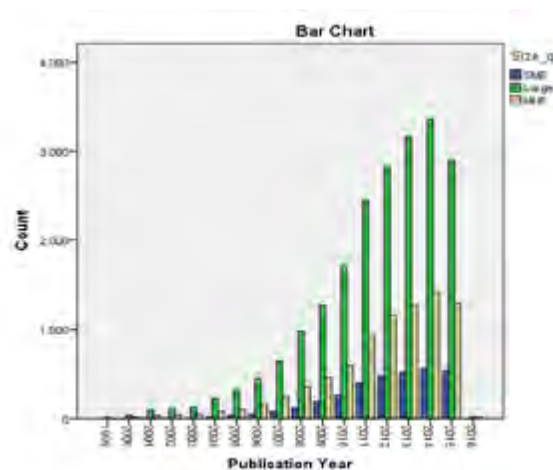
**Table 1 Sustainability Reports by size**

	Size_q			Total
	SME (< 250 headcount)	Large (≥ 250 headcount)	MNE (≥ 250 and multinational)	
1999	0	11	1	12
2000	1	33	14	48
2001	6	92	33	131
2002	6	111	44	161
2003	5	131	46	182
2004	13	225	75	313
2005	29	310	97	436
2006	48	452	169	669
2007	76	644	251	971
2008	125	982	364	1471
2009	190	1273	459	1922
2010	262	1709	596	2567
2011	399	2452	941	3792
2012	471	2827	1149	4447
2013	513	3164	1274	4951
2014	567	3365	1425	5357
2015	529	2900	1290	4719
2016	3	16	15	34
<b>Total</b>	<b>3243</b>	<b>20697</b>	<b>8243</b>	<b>32183</b>

**Table 2 Sustainability Reports by ranges and size**

		Size_q			Total
		SME	Large	MNE	
until 2007	Count	184	2009	730	2923
	% of Total	0,0%	6,0%	2,0%	9,1%
2008-2010	Count	577	3964	1419	5960
	% of Total	1,0%	12,0%	4,0%	18,0%
2011-2012	Count	870	5279	2090	8239
	% of Total	2,0%	16,0%	6,0%	25,0%
since 2013	Count	1612	9445	4004	15061
	% of Total	5,0%	29,0%	12,0%	46,0%
Total	Count	3243	20697	8243	32183
	% of Total	10,1%	64,0%	25,0%	100,0%

**Grap 1**



**Table 3 Sustainability Reports by all the Sectors**

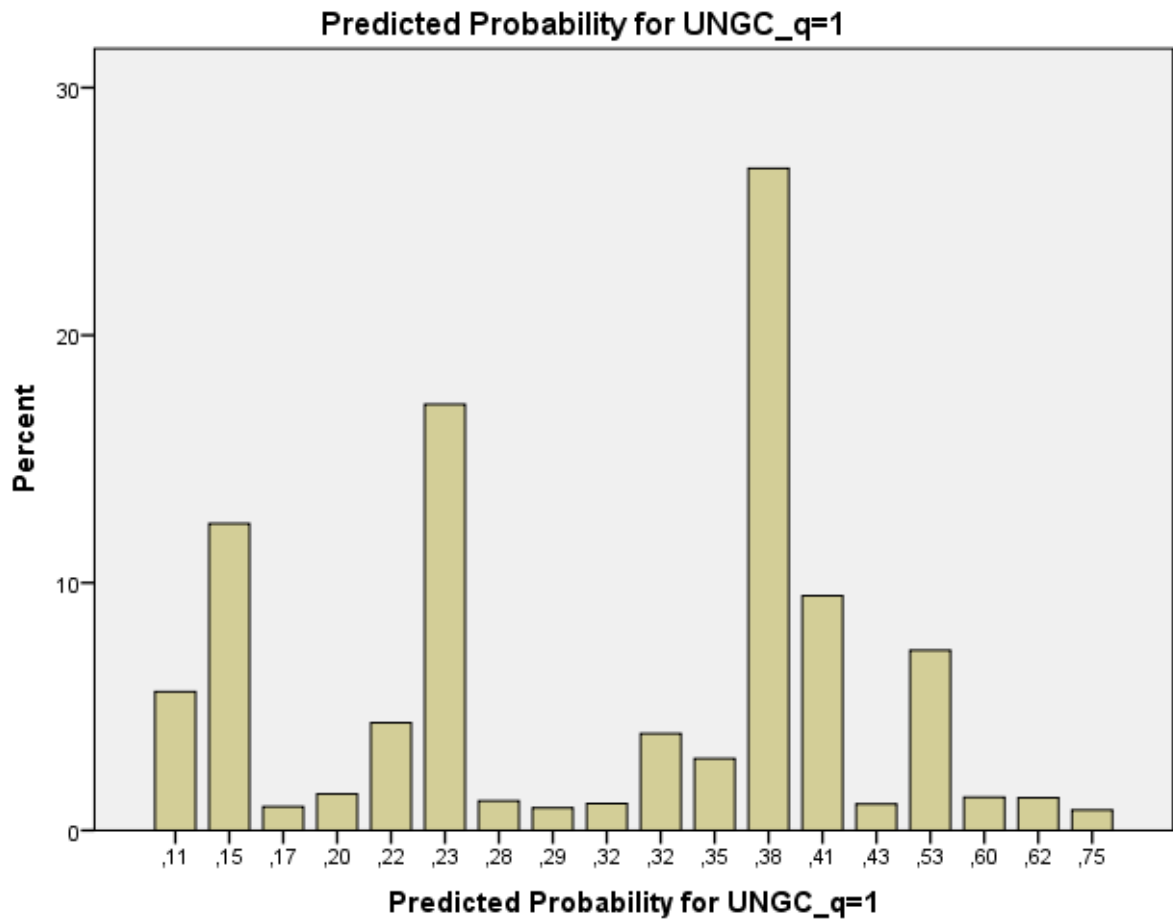
	until 2007			2008-2010			2011-2012			since 2013		
	SME	Large	MNE	SME	Large	MNE	SME	Large	MNE	SME	Large	MNE
Agriculture	19	2	2	24	22	14	9	43	31	37	86	49
Automotive	0	53	35	0	85	29	2	117	62	14	214	120
Aviation	0	51	1	1	88	8	4	112	21	3	208	43



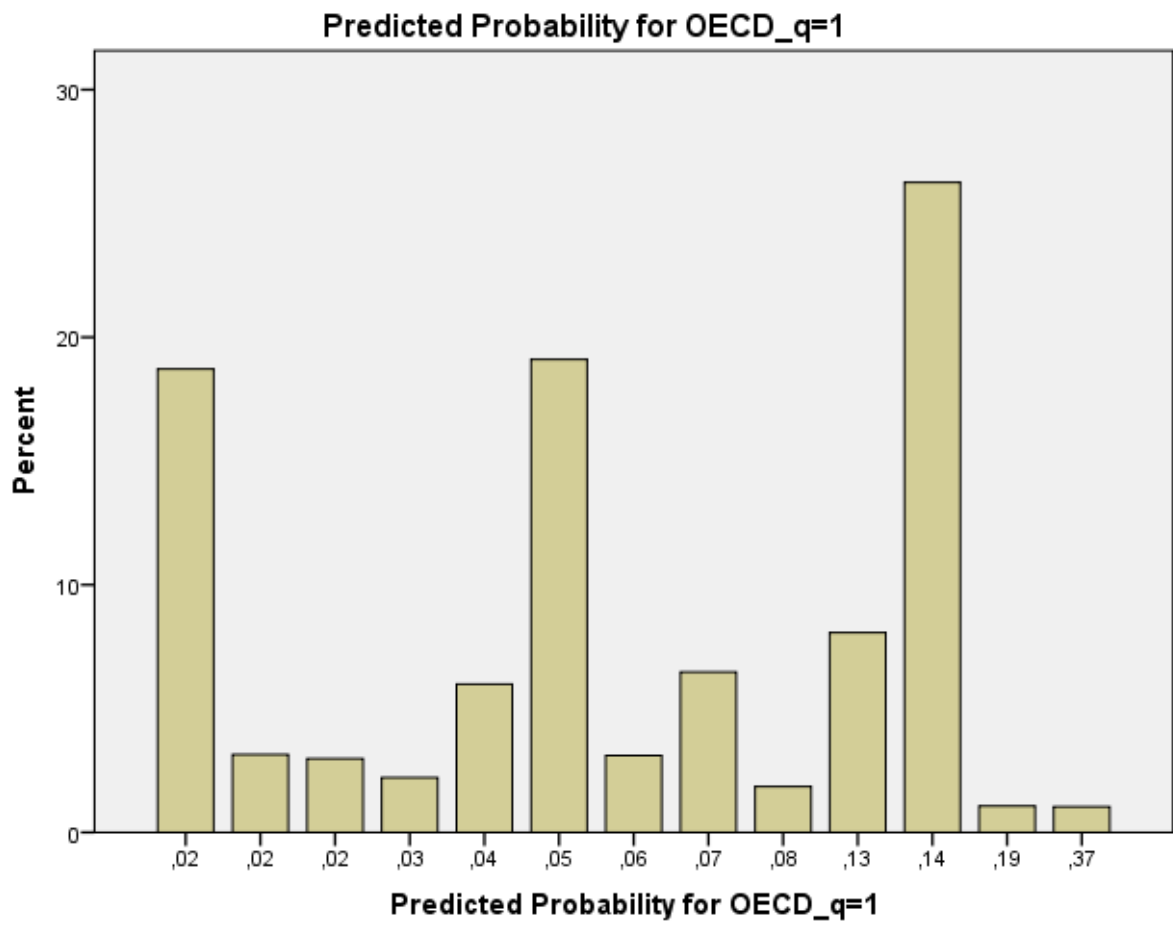
Chemicals	0	72	36	6	122	82	11	176	110	33	299	196
Commercial Services	18	23	6	36	63	22	32	81	57	54	157	115
Computers	0	4	21	3	23	34	6	33	37	18	83	70
Conglomerates	0	46	40	2	118	74	4	143	80	14	250	147
Construction	9	49	25	19	139	41	18	180	76	34	314	114
Construction Materials	9	55	15	11	79	31	12	138	48	34	247	90
Consumer Durables	0	30	9	4	40	29	7	43	33	8	61	64
Energy	1	163	46	15	345	65	32	397	100	76	738	204
Energy Utilities	3	179	11	14	308	38	25	308	41	41	498	81
Equipment	5	40	38	4	66	82	3	96	103	14	173	194
Financial Services	22	298	64	41	570	140	63	724	190	129	1392	392
Food and Beverage Products	13	106	36	17	218	106	41	328	141	80	566	274
Forest and Paper Products	8	61	9	17	72	17	26	96	16	38	147	29
Healthcare Products	0	35	45	5	72	60	8	100	80	18	183	151
Healthcare Services	1	11	0	4	27	4	15	57	24	28	149	42
Household and Personal Products	3	46	24	7	37	29	7	54	36	25	89	71
Logistics	1	30	9	13	104	20	11	129	40	18	229	85
Media	0	19	9	12	43	13	16	64	24	33	104	55
Metals Products	1	54	11	6	90	36	6	134	46	15	224	89
Mining	2	100	34	7	194	67	14	260	102	15	384	174
Non-Profit/ Services	23	12	0	81	56	7	125	56	12	233	95	35
Other	19	92	46	94	221	106	161	334	204	214	611	403
Public Agency	7	26	0	29	88	1	38	98	5	69	160	13
Railroad	1	18	0	6	33	1	6	43	3	8	95	14
Real Estate	4	10	9	21	65	38	41	157	59	67	317	117
Technology Hardware	0	31	65	1	75	88	8	103	114	15	206	205
Telecommunications	1	114	25	1	179	44	0	213	53	6	342	95
Textiles and Apparel	1	10	7	16	34	7	27	57	20	29	118	47
Tobacco	0	32	10	0	15	7	0	9	5	0	15	10
Tourism/ Leisure	6	7	2	22	39	8	27	86	22	54	158	61
Toys	0	0	0	0	3	2	0	2	6	0	3	4
Universities	1	8	0	6	24	0	14	60	3	34	74	5
Waste Management	1	19	0	8	32	3	24	37	4	50	81	10
Water Utilities	2	44	2	14	68	3	17	75	8	38	126	11
Retailers	3	59	38	10	107	63	10	136	74	16	249	125

**Table 4 Sustainability Reports by Region**

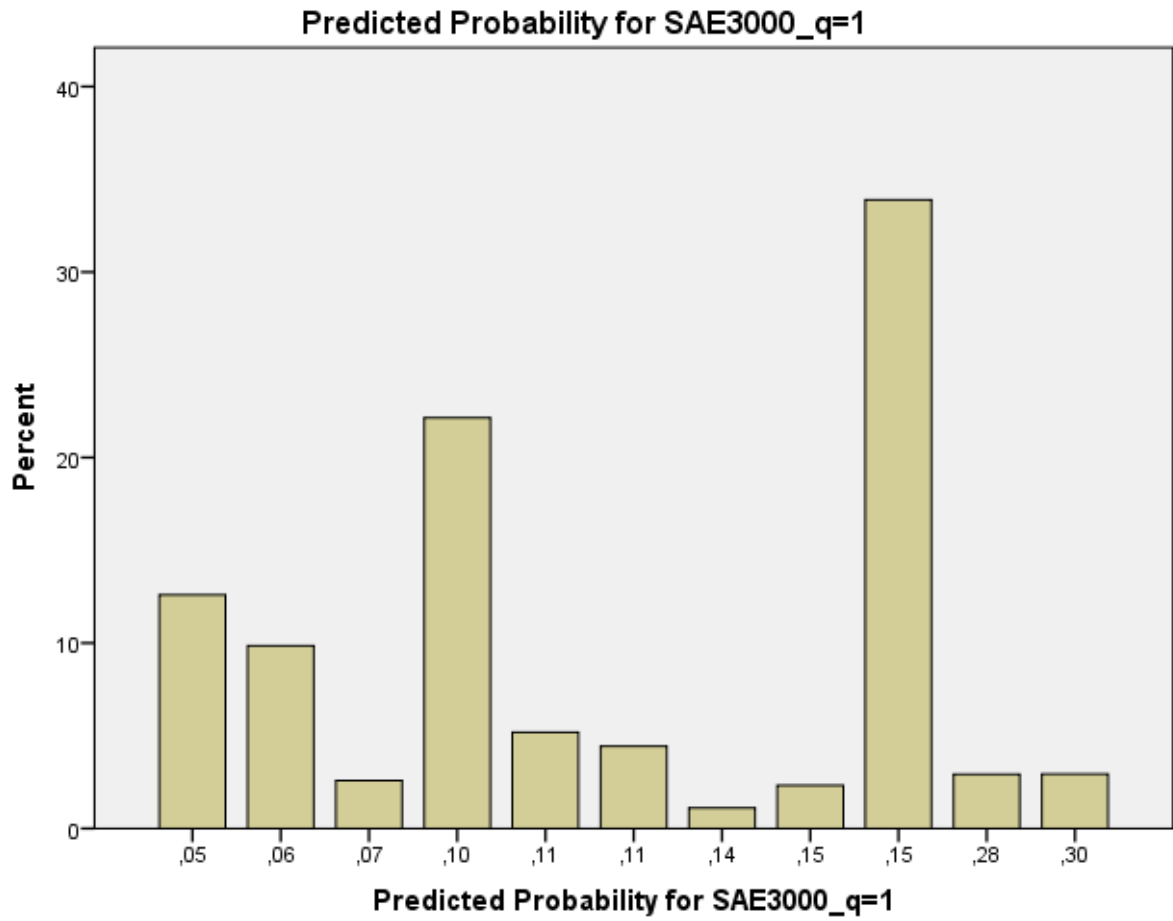
	SME				Large				MNE			
	Ranges				Ranges				Ranges			
	until 2007	2008-2010	2011-2012	since 2013	until 2007	2008-2010	2011-2012	since 2013	until 2007	2008-2010	2011-2012	since 2013
Asia	10	65	98	235	336	953	1352	2588	250	532	634	1151
Europe	110	311	481	822	1005	1683	1861	3313	239	440	670	1413
Latin America & the Caribbean	18	93	104	290	204	590	747	1503	11	86	162	342
Northern America	22	48	79	139	228	375	548	962	168	254	439	792
Africa	3	11	54	59	135	206	590	793	8	22	88	126
Oceania	21	49	54	67	101	157	181	286	54	85	97	180



Gráf 2



**Grarf 3**



Grapf 4

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## HUMAN-CENTERED CO-EVALUATION METHOD FOR DIGITAL SERVICE EXPERIMENTS

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*This paper develops a human centered co-evaluation method for the evaluation of service innovations. The method derives from two different theoretical approaches. It integrates multi-criteria evaluation framework to evaluate multiple impacts of solutions and process of developmental evaluation to support multi-voiced evaluation and continuous learning. New method emphasises human and societal impacts, which are analysed symmetrically with the traditional techno-economic characteristics of innovations. The method have been empirically tested and further developed in the context of an innovation experiment, which aimed to develop an 'integrated model of wellbeing' for child and family services.*

### 1. Introduction

The current transition into the digital era is radically changing the service context in our societies. The digital era revolutionizes traditional hierarchical and sector-specific service provision. To ensure the usability of the services, the systemic nature of innovation should be considered: in renewing the services simultaneous development of organisations, technologies, services, and multiple partner relationships takes place (Geels, 2002, 2004; Kemp et al., 2009).

Public sector services aim at creating social value by improving the wellbeing of citizens (Kroeger & Weber 2014) and reducing the target group's social need. Their ultimate aim is not to gain profit, but to create public value (Hartley, 2005, Levesqué 2013). In digital services, the roles of citizens and employees may change radically. More skills and agency may be required from citizens and routine work of the service employees may diminish (e.g. Berger et al. 2016). Digitalization can be a great opportunity for those, who have the knowledge and devices to use digital interfaces, but simultaneously a threat to the disadvantaged citizens.

Evaluation of service innovations in general tends to focus on single values of technological progress and cost-efficiency. However, techno-economic perspective is too narrow to describe the multi-faceted and interactive nature of public services. The

aim of our paper is to outline an evaluation method based on theoretical thinking of Djellal & Gallouj (2010, 2013), which captures the diversified nature of service innovation. We propose that the approach should be combined to the methods of developmental evaluation, which creates a process for mutual learning between inclusive actors. As a main aim of this paper, we suggest a human centered co-evaluation method, which focuses on multiple values of solutions, and creates a process for mutual learning and capability building between inclusive actors.

The developed method consists of 1) multi-criteria framework which is used to evaluate multiple impacts of innovation (Djellal & Gallouj, 2010, 2013; Hyytinen 2017), and 2) participatory evaluation process to support multi-voiced evaluation and learning (Patton, 2011; Saari & Kallio, 2011). The multi-criteria evaluation tool unfolds impacts of innovations into six dimensions. Specific emphasis is on human and societal impacts, which are analysed symmetrically with the traditional techno-economic characteristics of innovations. Dimensions included are impacts on citizens, professionals and society as well as impacts on economy, integration of technology and services, and brand image.

We tested the human-centered co-evaluation method in evaluating an experiment, which aimed to develop an 'integrated model of wellbeing' for child and family services in one middle-sized Finnish municipality. Our analysis is based on voice-recorded discussion data and observations in two hours evaluation workshop. The evaluation process brought professionals and potential distributors together and made them to evaluate multiple impacts of the experiment in accordance with the new evaluation method.

This paper is structured in five sections. The second section after this introduction presents the central literature focusing on user and employees central role in evaluation, multi-criteria approach and theories on learning. The third section describes a new evaluation methodology. Fourth section presents the empirical context in child and family services and research methodology we have applied in data gathering and analysis. In the fifth section we describe our results and the final section sums up the study, provides some managerial and policy implications and gives ideas for further studies.

## **2. Theoretical principles of human centered co-evaluation**

In this section we discuss the three theoretical approaches that form the starting point in our study. At first, we discuss the need to strengthen the role of customers and employees in innovation and evaluation. Then, we explain multi-criteria approach to evaluate service innovations. To end this section, we discuss the elements of intentional network learning as a basis of evaluation process.

## 2.1. Customers and employees as agents of digital service and impact evaluation

As service dominant (SD) logic becomes the prevailing way of organizing offerings, customers are considered as active co-creators of value adapting the service to their individual needs. Service suppliers' motivation is to understand and improve customers' mundane practices in order to create value for the customer. This means not only getting feedback from customers during the service, but even gaining understanding of where and how supplier's offerings fit customer's overall activities. Co-creation opportunities are integrated into the service itself, in supplier's encounters with the customers. Mobile services are designed to engage customers to co-create innovative goods, services and experiences. In the health care services, the traditional role of the citizen as "a recipient of services" is expected to become increasingly active, not only by taking care of his/ her wellbeing, but also as a user of mobile applications connected to health records and services.

Although this promise of co-creation within a single service is huge, we still have some doubts on how mundane needs of citizens may guide service integrations and digital platforms. When we think new digital service innovations from the point of view of everyday life of the citizen and a potential user, we should even go further than SD and ask how digitalized services change the everyday life of the customer in the first place. Can the citizens really influence on offerings of the suppliers based on their needs or are they first offered a service which they then try to adapt themselves as users, although this is called a co-creation opportunity?

Understanding citizens' life in a holistic way, not only as a service user, may open a new perspective to innovating new services. For example understanding continuities, disruptions, rhythm and routines in everyday life of the elderly people could contribute to designing new service offerings for the elderly (Kivilehto & Ritala, 2014). Research on what kind of everyday life produces wellbeing of the citizen (Korvela & Tuomi-Gröhn, 2014) may draft another kind of 'big picture' on how and what services should be digitalized or what kind of services should be integrated.

The frontline employee's role is in transition in the complex and digitalized service environment. The routine part of service work may disappear because of the digitalization. The occupation-based approach of Frey and Osborne (2013) estimates that as much as 47% of all people employed in the US will be replaced by computers and algorithms within the next 10 to 20 years. However, this estimation has been criticized for using occupations as a unit of classification, and for overestimating the development speed of implementing new technologies. A job task-based approach has been proposed as being more realistic. Automation usually aims to automate certain tasks rather than whole occupations, and bundles of tasks that cannot be easily automated always exist. A task-based approach to automatibility in the 21 OECD countries estimates that only 9% of jobs are potentially automatable (Arntz et al., 2016).

However, as the face-to-face servant role of service employees may seemingly fade away when the technological interface pushes them into back offices, these employees should be given the opportunity and space to form new agencies and adopt new roles and relations. They may become innovators of new services based on their deep experience with clients; enablers, helping and training clients to use technology; differentiators, giving a genuinely empathetic and personal face to the surface of the

service, or co-ordinators, handling integration and building bridges between different offerings (Bowen, 2016).

In at least the implementation phase of e-services, service workers' agency may depend on how quickly and smoothly customers are willing to adopt the role of co-producer of the service, and be guided to increase the use of self-service with the IT system (Breit & Salomon, 2015, Berger et al., 2016). Previous studies of e-government have perceived increases in staff workload because the staff must simultaneously assist citizens in digital communication and guarantee face-to-face service to the most vulnerable citizens who have neither the competence, nor possibility, to use digital services (Berger et al., 2016).

Employee-driven perspectives on innovation consider employees as active agents in renewals (e.g. Høystrup et al., 2012). Case studies so far indicate that empowering and allowing employees to apply their customer know-how and ideas to service innovation increases preconditions for development, improves services, and positively influences their well-being (Hasu et al. 2014; Honkaniemi et al., 2015). Employee's participation bring a significant view of everyday life of themselves and their customers into evaluations. Anticipating impacts of service renewals for their future and prevailing work in evaluation, may also enhance them to see how they want to develop their work and expertise.

To sum up, this principle relies on the expectation that frontline employees and citizens using existing services bring an important perspective for altering the services both in incremental or radical way. Therefore, they or at least their representatives should be involved in evaluations of digital service innovations.

## **2.2. Multi-criteria perspective to evaluate service innovation**

The evaluation of innovations has been typically based on science and technology (S-T) indicators, highly oriented towards the technological aspects and economic impacts of innovations. This narrow approach has been criticized in service studies as it neglects the novelties based on immaterial values and interaction (Rubalcaba et al., 2012; Toivonen, 2010). In particular, researchers have pointed out that the traditional evaluation methods and measures are not able to capture the diversity of innovations and the multifaceted performance in service sectors (Djellal & Gallouj, 2013).

The increasing "servitization" of society has put pressure to develop more advanced approaches to evaluation. In some recent studies (Dyehouse et al., 2009; Williams & Imam, 2007), a plurality of methods and starting points for new evaluation criteria have been suggested. According to them, impacts should be assessed on the basis of a multidimensional approach to take into account the issues of quality, reputation, social innovation and social value (Djellal & Gallouj, 2013).

The reasoning is rooted in the "broad view on innovation" (Dosi et al., 1988; Kline & Rosenberg, 1986; Lundvall, 1992; Nelson & Winter, 1982), that highlights complexity, uncertainty and interactivity in the development and implementation of innovations. In other words, it favors a systemic perspective. Recently, the systemic and network perspective has become topical – not only in terms of multiple actors – but also concerning the novelty itself. It has become apparent that that the most urgent problems in the present society cannot be solved via individual technologies or services, as

these problems form systemic wholes and require systemic solutions (Harrison et al., 2010). This development puts additional pressure on the renewal of evaluation of innovations.

This Djellal-Gallouj approach analyses the diversity of innovations and the multifaceted nature of their performance by linking them to the idea of different ‘worlds of services’. The concept of ‘a world’ is derived from the ‘economics of convention’, developed by Boltanski and Thévenot (1991), and refers to different justificatory criteria used in society in the definition of different values. Djellal-Gallouj approach (2013) identifies six different ‘worlds’ that provide criteria for evaluation: the industrial and technological world, the market and financial world, the relational and domestic world, the civic world, the world of innovation, and the world of reputation. The outcomes of innovation can then be evaluated from the perspective of different goals or target areas: besides the traditional technical and financial aspects of innovation, the complex societal challenges and the specific characteristics of services linked to quality and social value can be taken into account (Djellal & Gallouj, 2010, 2013; cf. Rubalcaba et al., 2012). In addition to the different target areas, the approach pays attention to the time-scale in the generation of impacts through the division into direct, short-term outputs and indirect, long term-outcomes. Table 1 illustrates the different worlds and the specific justification criteria related to the each of them (Djellal & Gallouj, 2013).

Table 1. A multi-criteria perspective to the evaluation of services (Djellal and Gallouj, 2013)

	<b>Industrial and technical world</b>	<b>Market and financial world</b>	<b>Relational and domestic world</b>	<b>Responsibility world</b>	<b>Innovation world</b>	<b>Reputational world</b>
<b>Output (direct, short term)</b> <i>Performance related</i>	Volumes, flows and technical operations; (performance, efficiency, scientific principle)	Value and monetary and financial transactions, money, savings	Interpersonal and organisational relations, trust, quality of relationship	Values like sustainable development, responsibility, equal treatment, fairness and justice	Creativity and inspiration	Brand, image
<b>Outcome (indirect, long term)</b> <i>Performance related</i>						

On the other hand, the researchers are unanimous that the existing innovation and performance measures and indicators should not be abandoned. What is needed is a more diversified analysis framework that is able to take into account the multiplicity of innovations and the increase of their social and systemic nature (cf. den Hertog, 2010; Rubalcaba, 2006).

### 2.3. Solution of a societal problem as a motive for intentional learning

As described in the section above, current societal challenges are too big to be solved by individual product or service innovation created in individual organisations. Topical question in service research is how to examine and develop innovations at the systemic level (Ostrom et al., 2015; Toivonen, 2015). Inter-organizational learning has been highlighted as a solution to these complex and multifaceted problems. Although scholars of service research have recently used the concept of learning (e.g. Lusch et al., 2010) in their texts, it has mainly referred to how firms could learn to serve a customer or how a firm could learn to become vital and sustaining part of the value network. Learning has been described as an adaptation process to customers' needs, which liquefying information resources via digital communication and computation has accelerated and shifted into macroscale without pondering whose intentions and motives are guiding the overall development of the service system. In service research, learning in the level of entire value network, emphasizing active agency and intentional learning of all the participants related to a societal problem still needs to be elaborated.

In the ecosystem management literature, in the area of sustainable development and nature ecosystems we may find studies dealing with inter-organisational learning and learning in networks (e.g. Manring, 2007; Mandell & Steelman, 2003; Manring & Moore, 2006). This literature points out that a transcendent vision and a unifying purpose among stakeholders is needed for generative learning. These empirical analyses of long term projects have used organisational learning theories to identify and outline the dynamics of their success. They have referred to organizational learning scholars such as Argyris and Schön (1978), Easterby-Smith and Lyles (2003) and Senge (1990), who are concerned on explanatory mechanisms for success and failure in organizational renewal from the managerial perspective. However, this literature does not guide what kind of method or facilitation could lead into inter-organisational learning and productive co-creation between stakeholders.

Theory of expansive learning derived from cultural-historical activity theory provides an avenue for learning-oriented evaluation. In activity theory, the concept of object is central (Leont'ev, 1978). The object embodies the meaning, the motive and the purpose of a collective activity system or even systems. Different participants take different partial perspectives on the object, it is internally contradictory and constantly changing. Expansive learning in a community begins when, during the course of activity, some individuals begin to question the current goals, patterns and norms, even the basic motive/need of the activity, and search for new practices. In some cases, this escalates into collaborative envisioning and a deliberate collective change effort at grassroots level (Engeström 1999, 2001a, 2001b), after which a new motive and expansive cycle follows.

In the evaluation process the participants are offered a tool, which enables them to understand the service innovation in a wider context and long-term horizon. In our case the tool is based on multiple values and criterias, and is theoretically grounded as described in the previous section. Reflexive tool use and collective evaluation has been previously used in developmental impact evaluation for innovation networks (Saari & Kallio, 2011). However, human-centered co-evaluation is based on a different learning method, which supports dialog between developers and potential distributors of the experiment. The dialog is supported by an aquarium method, which has

been used in solving severe conflicts in a work community and also as an evaluation method (Aalto-Kallio & Hakulinen, 2009). It is based on active listening: it instructs participants to listen, allows them to communicate and guides them to create further actions.

To sum up, this principle emphasizes that evaluation process provides an intentional learning arena and process to guide the development of a service innovation. What is needed to enhance learning, is a tool, unfolding the societal context of the innovation for collective reflection and an interactive method to create an open dialog in a trustful atmosphere.

### **3. Method of human-centered co-evaluation**

The new approach consists of 1) a multi-criteria framework that will be used to evaluate various dimensions and values of the innovation, and 2) a participatory evaluation process to support multi-voiced evaluation and learning. We have combined these two approaches in a practical evaluation method, which is described in detail in this section.

#### **3.1. Multi-criteria framework**

The multi-criteria framework evaluates impacts of service innovations from the perspective of six dimensions. Dimensions included are impacts on citizen, employee and population as well as impacts on reputation, integration of technology and services, and economy. Three first dimensions have been categorised as social indicators because they put emphasis on human and social aspects of service innovation. Three later dimensions emphasise technical and economical characteristic of innovations; they are thus categorised as techno-economic indicators. Horizontal axis instead illustrates the scale of analysis: dimensions on the left hand side in the framework analyse impact and value from the perspective of individuals (including individual organisations) or group of individuals. Dimensions on the right hand side analyses broader impacts for example from the perspective of wider population, society and economy.

In accordance with former evaluation approaches (cf. Djellal & Gallouj, 2010, 2013; Hyytinen, 2017), framework analyses symmetrically societal impacts and the more traditional techno-economic characteristics of innovations. Thus, it aims to create balanced and comprehensive picture of impacts generated by a service innovation. Specificity and novelty in the new framework is the emphasis on human values, which means that evaluation includes the analysis of impacts from the perspective of citizen and employee. Human aspects in the evaluation makes visible the value from the perspective of various individual actors involved in service generation and utilisation. Following figure 1 crystallises the main dimensions of multi-criteria evaluation framework.

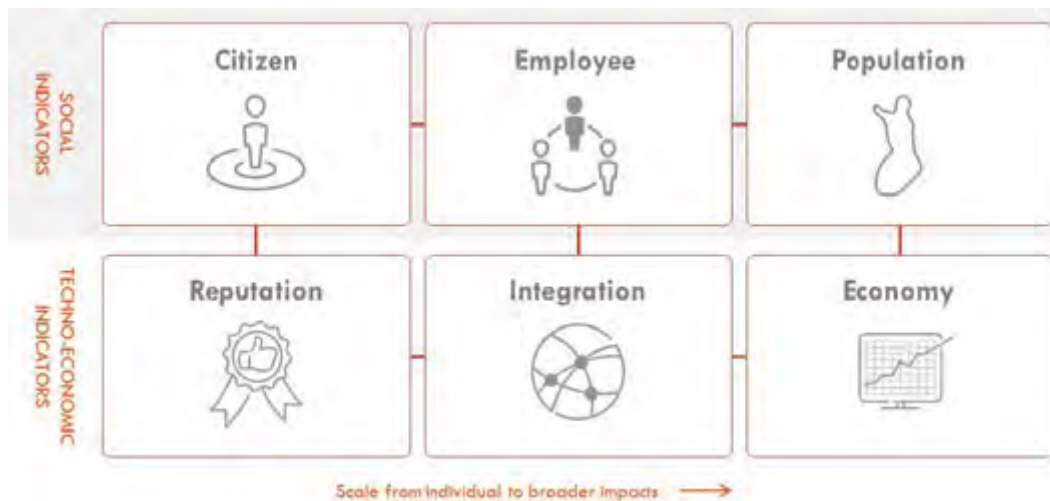


Figure 1. Impact dimensions of multi-value evaluation tool.

Each dimension in the framework includes variety of aspects and possible areas of impacts. We have identified the potential impact areas and concretised them with assistant questions. These questions help involved actors (i.e. evaluators) to analyse value from multiple perspectives. As follows, we concretise potential impact areas included in each dimension. We also give examples of the assistant questions to concretise the application of the framework in a practical evaluation situation.

Impact on **citizen** analyses the value of new service innovation from the viewpoint of an individual service user. Emphasis is on customer-orientation and significance of a service, which in concrete evaluation situation can be enquired for example in a following way: what kind of customer needs new service have resolved and how it have resolved the customer needs. Dimension also focuses on a service experience including accessibility and quality from the viewpoint of a citizen. These aspects can be acquired for example by asking if a new service affected experienced service quality. Moreover, impact on wellbeing, citizen empowerment and interrelationship with family and employee are evaluated.

Impact on **employee** focuses on changes in a content of a work, including work roles, knowhow and concrete duties. In the concrete evaluation situation the assistant questions are for example how the new service have affected the work role of an employee and what have been the main changes? Moreover, dimension pays attention to collaboration and means of interaction; specific focus is on a relationship with citizens and other employees. Also changes in well-being of employees are evaluated.

Impact on citizen and employee captures the value from a perspective of an individual or small group of individuals whereas impacts on **population** focuses on an impact from the perspective of wider population. Dimension analyses customers' needs and service availability for example in the context of specific geographical region. As a concrete question enquired in the evaluation situation is how a new service meets customers' need in the specific geographical region and how it have affected the availability of services. In addition, Dimension includes aspects like a social and ecological sustainability, equality and rightness of a service.



As regards the **reputation**, focus is for example on effects on brand image and visibility of actors involved in service development. In the concrete evaluation this can be enquired, how a new service - or participation in service development - has affected a brand image of involved actors. Moreover, attractiveness and public image of a service are evaluated by asking for example the following questions: has the new service been discussed in public, what has been the public image and how attractive is the new services from the citizen viewpoint.

**Integration**, instead, focuses on the value of the service and technology integration and interaction. Dimension aims to provide understanding why different services and technologies are required for a new service development, how services and technologies have been integrated with each other and into the prevailing system and what is the value of the comprehensive service solution. These aspects can be enquired for example: how the different services have been integrated to better serve customers' need or what kind of technologies have been integrated into a new service and how the integration have been managed. Furthermore, dimension evaluates the functionality between different services and technologies as well as the means of interaction.

Last dimension, **economy**, focuses on economical effects of a service by considering them from a perspective of both single actor of actor group and broader society. As regards the single actors, evaluation focuses for example on new potential resources, savings and cost-effectiveness. These aspects can be captured by asking evaluators to specify economical effects a new service have generated. Besides, it aims to identify new possibilities in business and export.

In the actual evaluation situation, aim is to capture the changes in accordance with each dimension. In concrete terms, evaluators are asked to consider how a new service has generated value from the perspective of each dimensions. To make visible the potential disadvantages or surprises evaluators are asked to consider both positive and negative changes as well as anticipated and unanticipated effects.

The evaluation approach can be applied in the different phases of a service development. To support a service development in its' different phases, we suggest that the evaluation is conducted in an early planning phase, in the middle phase and in the final phase of the development process. In the different phases of the process application have a slightly different function. In the early planning phase, it supports target setting and helps to identify multiple target areas and potential impacts of a new service. In the middle phase, it helps to compare the changes against the set targets and thus recognise the direction of changes. It also provides information if the development is going to the desired direction or if there is need to make any changes in direction. Evaluation in the final phase evaluates the generated impacts and gives indication of the potential impact in longer term. In the following sub-section we illustrates how the evaluation could be conducted as a participatory process to support learning and reflection throughout the development process.

### 3.2. Evaluation process – learning between developers, users and enhancers

The evaluation process between developers, users and potential actors, who may promote the innovation experiment provides an arena for learning and reflection along the development of the experiment. As mentioned earlier, the significance of the common tool and multiple criteria in the evaluation process, is to create an insight for the participants to understand potential value of a service innovation from the multiple perspectives and also in the wider societal context and long-term horizon.

In a practical evaluation situation, we bring developers, users and enhancers into the same table to learn what has been achieved, and what should be accomplished and done in near future. The multi-criteria framework is used as a formal evaluation framework but also as a source of inspiration in the discussion between involved actors. However, to create constructive interaction and dialogue is a challenge, when actors from different premises and interests come together. Learning from each others' viewpoints becomes possible only if the prevailing atmosphere becomes open and trustful. We suggest that active listening of each participants' observations and judgements of each element should be guaranteed in the process. We created a process for active listening and reflection between participants: it instructs participants to listen, allows them to communicate and guides them to create further actions.

In the evaluation situation participant are divided in to two groups: inner circle and outer circle. To the inner circle we invite those who have been involved in developing the experiment, such as the managers, supervisors, employees, ICT-designers and users of the service. To the outer circle we invite those who have a possibility to promote the experiment into wider use, such as the directors, collaborators from other services, and funding agencies. The figure 2 represents the positions of inner and outer circles in the evaluation situation.

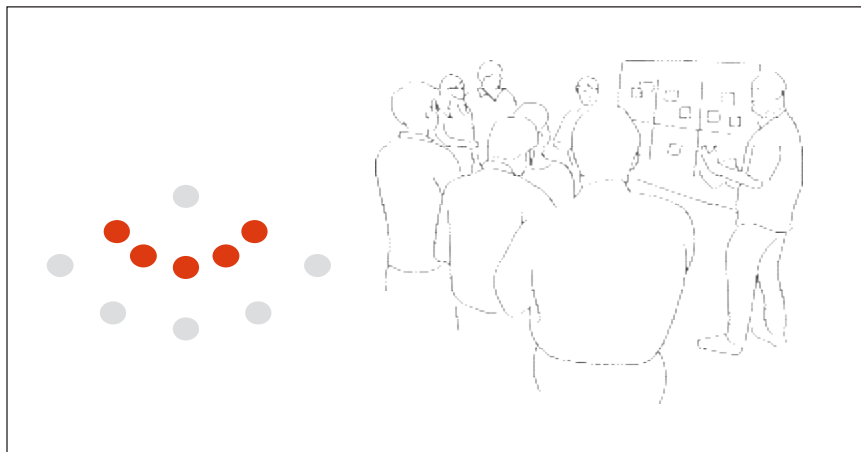


Figure 2: The inner and outer circle in co-evaluation

The evaluation process needs also a facilitator, who provides a rhythm to the interaction. The pros and cons of the benefits of each element become visible only if contradictory viewpoints are allowed to collide with each other. Before the interactive process, each element and its quantitative indicators have been collected as basis

for collective sense-making and judgement. In the following, we open up the co-evaluation process step by step:

- 1) The purpose and stage of the experiment is at first described by the main developers, and an eye-witness of the experiment, the user or employee of the service experiment.
- 2) The inner circle evaluates then how the experiment has succeeded in each element. They discuss what the measures of each element mean and add their qualitative reflections to each element. In this phase colliding perspectives are allowed and valued. The discussion is documented to post-it papers and put into boxes of the tool.
- 3) While the inner circle is having the evaluative dialogue, the outer circle is not allowed to speak, but their task is to actively listen of the participatory evaluation. They may make notes and observe which perspectives collide with each other, and identify how to develop the experiment further.
- 4) The inner circle and outer circle change their positions. Now the outer circle is allowed to discuss and the inner circle only listens. The participants of the outer circle should discuss what they heard and what they may conclude from the inner circle's evaluation. They should sum up their discussion by presenting: what are the lessons learnt, what should be done next and how they may contribute to the implementation.
- 5) The inner circle then comments how feasible the suggestions are. They may decline one of the suggestions and add their own ones. Finally, they decide who should promote each act and when.

The co-evaluation workshop takes about 2,5 hours as whole and it combines the benefits of participatory evaluation and external evaluation.

## **4. Empirical context and methodology**

Our empirical study experiment the evaluation method in the context of 'integrated model of wellbeing' (IMW) for child and family services, which has been developed in a middle-sized Finnish city (with 67 000 inhabitants). The development was part of a nation-wide project that aimed at promoting local experiments as an alternative to centralized planning in the renewal of public services. The goal of the nation-wide project was to accelerate innovation in the public context and in this way to answer better the needs of citizens and empower them, enhance multi-actor collaboration, and reduce costs. This section presents the research context in more detail and describes the collection and analysis of the empirical data.

### **4.1. Experimenting the evaluation method in the context of child and family services**

The 'integrated model of wellbeing' in our case city was a life-cycle based total offering whose objective was to support multi-professional work and reinforce the citizens' ability to take responsibility of their own wellbeing. The integration focused on the

sector of social care (child protection and family counselling) but it also included the preventive and therapeutic services for this population in the neighboring sectors: daycare, primary schools and health care. Integrated services were especially targeted to citizens who have multiple needs for social care and who therefore are in contact with different professionals from different sectors. The focus was on preventive services that can diminish problems whose afterward relieving requires much more resources. Four key processes were identified: early discussion about the concerns of citizens, high quality multi-professional collaboration, support to the parenthood (from pregnancy to adolescence), and the development of social skills of both parents and children. These processes were concretized into life-cycle based and integrated service products.

In the core of the model was the use of a digital platform as a mutual information and communication channel between citizens and different professionals. Another important cornerstone was a 'service plan' to which aimed at collecting together the various plans that were made for the customer, each of them answering a specific need. Aim was to commit both the citizens and all service providers to one service plan, and to empower citizens to participate actively in planning their services. One professional was responsible for the compilation of the integrated plan. He or she invited all other relevant professionals to this activity and to the respective implementation of the plan. An important element in the experiment was a digital platform which was established to facilitate the distribution of information: the professionals and the customer had access to common information. They could also update and complement the service plan that was made in the electronic form and located on the platform. Following figure 3 illustrates the key elements of the new developed service.

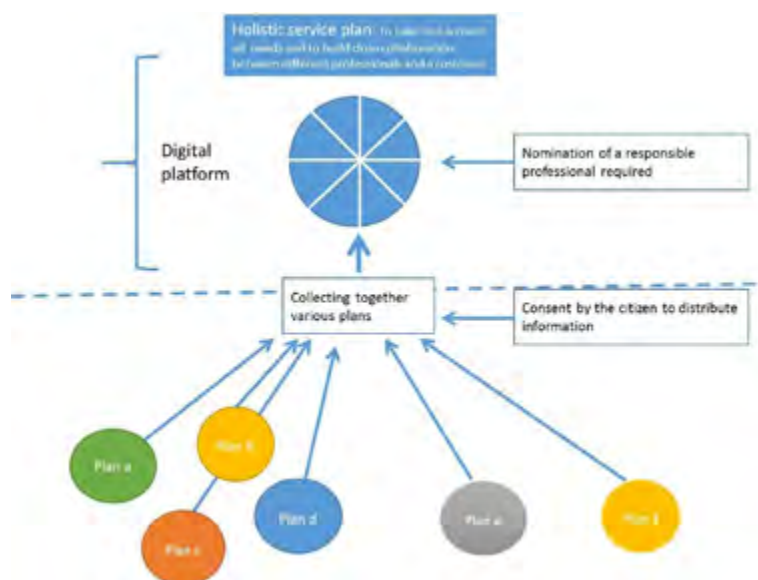


Figure 3: Holistic service plan in the context of child and family services (source: case municipality)

The principles of the renewal seemed to benefit both the professionals and the customers. The attitudes towards multi-professional work were positive due to the earlier experience, and there were no significant prejudices towards digitalization. However,

the practical launch of the novel practices turned out to be challenging and the achievements were actually minor, leading not to any permanent changes in the service delivery. In other studies, we have opened up background reasons and challenges met during the development process (Leväsluoto et al., forthcoming; 2017).

## 4.2. Data gathering and methods

The data has been gathered in co-evaluation workshop which has been organised as part of a two-day evaluation conference for six different experiments. Workshop was organised in December 2016 and its' length was 2,5 hours. In this paper, we report only the results regarding the evaluation of the integrated model of wellbeing. The case experiment was selected due to the open and trustful atmosphere and participants' impressive learning capacity in the workshop. Aim is to use this experiment as a sample to illustrate how the new evaluation method makes visible the variety of impact and can enhance collective learning.

The evaluation process brought professionals and potential distributors together and made them to evaluate multiple impacts of the experiment in accordance with the new evaluation method. The inner circle consisted of the director of young and children's services, an employee working as a service provider and an in-house ICT-support specialist. The outer circle included development director of Association of Finnish Local and Regional Authorities and two experienced researchers from Technical researcher of VTT. One of the researchers have been involved in collection in the experimental phase of this case, and the other one have a member of steering committee of the project.

Our analysis is based on voice-recorded and transcribed discussion data and observations (including the field notes) of the evaluation workshop. The analysis and interpretation of the data was made in a dialog between theory and empirical findings. Several rounds of analysis were carried out to derive meanings from data and to reduce the amount of data (Huberman & Miles, 1994). While reading the transcribed discussion data and observation notes we uncovered the most common and typical themes, and classified and structured them. Aim was to create holistic understanding of the research topic via systematic and thorough analysis rounds of the discussions. The quotations in the results sections illustrate the level at which extracts were picked from the material.

## 5. Results: Co-evaluation as a reflective process

We conducted the human-centered co-evaluation for the 'integrated model of wellbeing, IMW' in the context of child and family services. In the following, we describe how the evaluation proceeded phase by phase. We focus on how different viewpoints were heard and supported by the common evaluation tool; the human-centered evaluation tool for service innovations.

### *Evaluation setting*

The inner circle consisted of the director of young and children’s services, an employee working as a service provider and an in-house ICT-support specialist. The outer circle included two researchers, the other one had been involved in collecting data about the experimental phase of the case, and the other one was a member of steering committee of the service revolution project. In addition, development director of Association of Finnish Local and Regional Authorities was present.

### *The perspectives of the service director and professional*

The evaluation session started by prepared speeches from the perspectives of research, management and mundane service work. In the speeches the original aims of the integrated model of wellbeing were described as explained in the section 4.1

The spirit of all the speeches was honest and open. The director of services was very self-critical and analytical, pointing out that managing the experiment had been lame, because the owner of the project changed her job in the middle phase of the experiment. She summarized her speech: “*We can in no way say that we have succeed.*” (field notes 1.12.2016) The employee and the researcher of the case seemed to agree with the director, but gave several detailed reasons why the platform did not become a tool for the professionals or for the customers. These nourished the evaluative discussion and sense-making of the inner circle.

### *Evaluation of the inner circle: developers of the experiment*

After the opening speeches the inner circle started to discuss and fill in each dimension of the human-centered evaluation tool. The main insights of the discussion can be summarized into the following table 2.

Table 2. Insights produced by human-centered evaluation of the experiment

<p><b>CITIZEN</b></p> <p>The IMW prevents citizen to fall between services, but it requires active agency of his/her own life.</p> <p>The citizens with poor digital skills and poor life circumstances could not become active users.</p>	<p><b>EMPLOYEE</b></p> <p>The IMW did not become user-friendly and required citizens’ permission for documenting their data into the platform.</p> <p>Employees were not involved in planning the tool.</p>	<p><b>POPULATION</b></p> <p>The regulations in health care sector hinders transfer of patient data between services.</p> <p>Population level impact was not visible in the experiment phase.</p>
<p><b>REPUTATION</b></p> <p>If the IMW had been successful it would have improved the reputation of the town, but it was not realized.</p>	<p><b>INTEGRATION</b></p> <p>Integration between different ICT-systems was needed, but the IMW required double reporting and the technical interface was unwieldy.</p>	<p><b>ECONOMY</b></p> <p>In principle the IMW would save citizens’ and employees’ time, but it could not yet be tested.</p> <p>Because of the public context, the IMW technical solution had to be done quickly and low-priced with in-house ICT-providers.</p>

They started the multi-criteria evaluation from the **citizen** perspective. In the discussion it was realized that the role of the customer becomes more active if she uses IMW, as the director formulated: *"I think this strengthens the customers' possibility to take the responsibility from her own life, and from services that are her concern and her children's concern. The agency shifts from the professionals to the customers via this practice."* (1.12.2016 evaluation, inner circle, director)

However, the employee added, that not all the customers are capable to increasing self-service, as she stated: *"But some of the customers still want to have a plan made by the professionals."* (1.12.2016 evaluation, inner circle, employee). Some of the citizens may not be capable or willing to use a digital tool for giving information about their life circumstances.

From the **employee** perspective, it seemed that the tool was not user-friendly. Even the access to the system appeared complicated, as the ICT-support specialist described: *"The identification process for the professional was totally abnormal. She had to dig the mobile identification, because of the data security ... The feasibility lagged behind."* (1.12.2016 evaluation, inner circle, ICT-support)

The employees were not involved in planning the tool, so they felt it was given from above, which diminished their motivation to use it.

**The impact on population** could not yet been evaluated in the discussion, but in principle the equality between professionals and citizens was realized to increase, as stated in the discussion: *"The citizen and the employee become more equal, as the customers gets more responsibility and power, and also different services become equals."* (1.12.2016 evaluation, inner circle, ICT-support)

**The reputation** of the tool was discussed very briefly as it turned out that the tool did not yet gain any reputation. The town had gained good effect on other digital tools they had provided to the citizens. The director reflected: *"If these do succeed, these would have a big significance for the town. But we do not do these because of the reputation."* (1.12.2016 evaluation, inner circle, director)

**The integration** between different services did not go smoothly, as the transferring of the data between services was not automatic: *"We did not have any integration between service-specific ICT-systems, so it was like, they had to write the same things into two places or copy and then paste the data from a system to another."* (1.12.2016 evaluation, inner circle, ICT-support)

In principle, the idea of a tool, that would diminish double-reporting and avoid explaining the life circumstances from the citizen's point of view over and over again, would save both customers' and employees time, as was stated by the employee: *"I remember a mother who had a disabled child. She sighs that when new employees emerge, she has to start explaining everything all over again. She does not want to cope with it."* (1.12.2016 evaluation, inner circle, employee)

Another point of view for **the economy** was that the tool had to be acquired on the cheap, as described: *"Now we had to find the technical solution from our own premises. It was supposed to be done at a low price and quickly. In public sector you have to look at the in-house providers and you would not like to go into tendering."* (1.12.2016 evaluation, inner circle, ICT-support)

All in all, the inner circle reflected on every dimension, and it appeared that three different positions were all heard in the dialogue.

#### *Evaluation of the outer circle: Lesson learnt and suggestions*

The outer circle shifted into the center and inner circle became the outer circle. The outer circle pointed out three avenues how to continue the development. They concerned multi-professionalism, segmentation of the customers and scaling-up the tool.

First of all, the outer circle raised **the original reason** why the tool was needed into the focus: *"It seemed to be in principle very important for the professionals that the fragmentary nature of professionalism will diminish and they start discuss with each other. They felt that multi-professionalism cannot be promoted without this kind of concrete and shared platform."* (1.12.2016, evaluation, outer circle, N1)

Secondly, the outer circle realized that the tool would perhaps function for customers who were capable enough in using it. So they raised up that the **segmentation of the customers** were needed, as a member of the outer circle defined: *"My impression is that this tool did not take into account different customer segments. There are those who need more help, and those who can be quite independent. So when you go to citizen services, some need several services, and different kinds of aid. Some are dignatives and others are not."* (1.12.2016, evaluation, outer circle)

Thirdly, the outer circle positioned the tool into **wider perspective and use**. They pointed out that this kind of tool would be needed between municipal and regional level, particularly in social and health care reform: *"We definitely need this kind of service integration platform, or our customers go crazy in the social and health care reform, if the provincial level is not connected to the municipal level from the point of view of the citizen."* (1.12.2016, evaluation, outer circle)

The inner circle became clearly relieved about the outer circle's evaluation. The director acknowledged the comments: *"Thank you very much. It is so valuable to hear your feedback. I was prepared to disband the law allowing the experiment...and that was it. But now I feel a new kind of excitement and see this with new eyes, and can understand what was good. It is true, what you said, that we need such a digital platform between a municipality and the provincial level."* (1.12.2016, evaluation, inner circle, the service director)

To sum up, as the dynamic of the evaluation indicated, the developers of the experiment cannot easily see how to learn from the failures. The neutral attitude of outer circle was needed to ponder what was originally insightful in the endeavour. If we use the terms of expansive learning, we may conclude that the inner circle's reflection could be summarized to form the questioning phase, and the outer circle's reflection then produced the collective insight of possible avenues for expansion of the experiment into wider context. The aquarium method and the human-centered evaluation tool functioned as leverages in the process.

## **6. Concluding remarks**

In this paper, we have introduced a new human centered co-evaluation method for the evaluation of service innovations. The new evaluation method responds to the



current evaluation challenge, which has been noted within both service innovation research and within evaluation research. According to the former studies (e.g. Djellal & Gallouj, 2010, 2013; Patton, 2011; Rubalcaba et al., 2012) evaluation of service innovations tends to focus on single values of technological progress and cost-efficiency, which are too narrow to describe the multi-faceted, interactive and systemic nature of services.

The new method provides an alternative by emphasizing the systemic and collaborative nature of service innovation. It integrates multi-criteria framework to evaluate multiple impacts and values of innovation (Djellal & Gallouj, 2010, 2013; Hyytinen 2017) and participatory evaluation process (Patton, 2011; Saari & Kallio, 2011) to support multi-voiced evaluation and continuous learning. The multi-criteria evaluation tool unfolds impacts of innovations into six dimensions. Specific emphasis is on human and societal impacts, which are analysed symmetrically with the traditional techno-economic characteristics of innovations. Dimensions included are impacts on citizens, professionals and society as well as impacts on economy, integration of technology and services, and brand image.

The method have been empirically tested and further developed in the context of an innovation experiment, which aimed to develop an 'integrated model of wellbeing' for child and family services. According to our empirical analysis, multi-criteria framework in the model makes visible that the human and social values are equally important to technological and financial aspects of innovation. Participatory process functions as a learning arena to achieve collective insights to support the development and scale-up of innovations. At its best, collaborative evaluation process may provide new insights and speed up the development. For example, in our concrete evaluation process, professionals in the case organisation ended up seeing that the experiment has failed. However, the external evaluators helped them to consider the value of experiment from multiple perspectives, and learn from the failure. Their intervention energized the professionals to carry on with the experiment and scale it up at the regional level.

Based on our results, we propose that the human-centered co-evaluation method could, by clarifying the multiple values of public services, leverage scaling-up of new solutions and enhance the service organization's ability to conduct and learn from the evaluations. The new method, based on reflexive evaluation approach, facilitates interaction between developers and potential supporters and, thus, provides a promising alternative to support the continuous development and learning throughout the innovation development process.

As a managerial implication, we suggest that evaluation capacity should be know-how of each organization who develops services by experimenting. However, learning-oriented evaluation processes does not happen spontaneously, instead it requires a facilitator, who is trained into evaluation methods and who can use his or her time and effort into designing and conducting collaborative evaluation processes (Ensminger et al. 2015). In such an evaluation process even learning from the failures becomes possible. This may be called evaluation capacity building of the organization. It may be a know-how of the professionals, but it should be used between organizations.

The limitation of our study is, that analysis bases on one single case study. Therefore, as regards the further studies, more research would be useful to test the gener-

alizability of our results. In addition, there are many possible limitations and obstacles as regards the learning process. For example, lack of trust and negative competition between participants may hinder learning. More research and practical experiments are required to understand how to create an ideal collective learning process. Furthermore, generation of new type of systemic indicators to describe that complex and collaborative process in the generation of impacts would be both interesting and useful also from the viewpoint of management and decision making.

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## IMPLEMENTATION OF PUBLIC-PRIVATE PARTNERSHIP (PPP) ON THE LOCAL LEVEL - DEVELOPMENT OF SHELTERED HOUSING IN LJUBLJANA

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*Local level public-private partnership (PPP) are of crucial importance as the involvement of private entities with projects of public interest grants a wider array of development opportunities to the public entity. The working method has been oriented towards a review of sites developed by PPP, evaluation of urban planning based on SUS in Slovenian city municipalities, interviews with selected representatives of private and private investors, valorisation of urban dimension. Through the analysis of the case study the risks and rewards in a Slovenian sociological, spatial and economic reality are assessed while ideas on how to create a more fertile environment for the implication of PPP driven projects are developed.*

### 1. Introduction

The idea of spatial sustainability is a concept of a development for the human society that gravitates towards preservation of biological diversity and use of natural resources. There are many definitions of the term “sustainable development” yet one of the clearest is done by the World Commission on Environment and Development – Brundtland Commission that states: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Our Common Future, 1987: 43). While several sets of orientations and guidelines have been formed in the decades of growing environmental awareness and its conscious administration, all of them confirm the correctness of the 6 fundamental ideas that Jacobs (1999) defines as: “integration of the environment and economy, care for the future, protection of the environment, intergenerational justice and equity, quality of life and the principle of cooperation”. Sustainable development must be considered as a leading principle for city policies and management respectively as a basic development principle, which applies for Sustainable Urban Strategies (SUS), as well as for other strategic documents. In the Report by the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz et. al., 2009), the idea that the question of sustainability relates on the quality

of life was exposed. The report shows clearly that these three topics-economic elements, well-being and sustainable development - are closely interrelated (Bijl, 2011). It defines sustainable development as a process which includes balanced ecological and social development, while presence of social capital is important for the "well-being" in relations of modern society. In ensuring social sustainability (more trust, more cooperation, less inequality), it is not only for granting of social cohesion, but its increase and improvement of its effects.

A need for a sustainable development is needed more than ever. Land use planning, connecting individuals with the organisation of jobs and services and the financing of necessary infrastructure maintenance and improvements are a growing challenges within the concept of sustainable development. The crucial documents of the European cohesion policy 2014-2020 to support urban development are Common Provision Regulation, CRP (No. 1303/2013) and ERDF Regulation (No. 1301/2013) on the European Regional Development.

Within the framework of the Cohesion Policy 2014-2020, integrated sustainable urban development is clearly defined.

For a number of thematic objectives, for which support is provided, from the European Structural and Investment (ESI) Funds and the European Fund for Strategic Investments (EFSI), priority investments for the urban environment are identified, for example the promotion of low carbon strategies for urban areas, the improvement of the urban environment, including the rehabilitation of degraded areas and the reduction of air pollution, the promotion of sustainable urban mobility and the promotion of social inclusion by providing support for the physical, economic and social Revitalization of disadvantaged urban areas (article 5 of Regulation ERDF). These priority investments could be included in the Urban Development Strategy for Integrated Urban Development (Article 7 of the ERDF Regulation), complemented by actions that would provide priority investment from the European Social Fund (ESF).

The problem and the gap between the theory of sustainable development and the implementation of spatial interventions are very clear. It is also evident that the SUS are defined according to all the criteria for ensuring high quality sustainable urban indicators that follow the measures of cohesion policy 2014-2020 for improving the urban environment, revitalization of urban structures and rehabilitation of degraded areas. In this way, cities are encouraged to re-activate abandoned and under-utilized areas and buildings in cities and urban areas, and to improve the quality of public spaces, which affects the increase in economic activity, social progress and the improvement of the quality of life. Development of urban areas and their brownfields (*term in use in Slovenia is degraded areas –abbrev. DUO*), are priority interventions, since at the same time, with the revitalization of these, we maintain the cultural, historical background of each location, all the way to the regional level.

Therefore, PPPs are crucial for implementation and management of spatial interventions. But many governments and private sector organizations who had considered PPPs to be their future were forced to rethink their strategy in the wake of the crisis, as a lot of the available private funding upon which PPPs relied was suddenly no longer available to the same extent (Greve, Hodge, 2013). The crisis took much of the glamour out of PPPs, but theoretical advances have been made by researchers in a number of areas (ibid.).



## 2. Public-private partnership (PPP)

The governance of the public sector is a public interest. The public sector thus works in the public interest, and the limits of orientation towards the user are determined by the public interest, which means that the public interest also directs the amount and method of public activity in a particular field. These are the principles brought about by the movement of new public management, which is being upgraded with good governance theory and practice over the past decade through the Organization for Economic Co-operation and Development (OECD), and which is characterized by its emphasis on strategic The importance of politics, and not just the modernization of the administration; in the public interest, it is both spatial planning and the implementation of urban projects; therefore, in the concept of public-private partnership in the context of the implementation of urban projects, it is necessary to understand that the institute of public-private partnership is the institute of modern administrative systems which must be held in the light of the English term »good governance«.

The emergence of new models and modes of regulation and management calls for new, qualitatively different administrative procedures, which means processes of policy-making and implementation. The model of cooperation, which is the basis for new ways of regulation and governance, increases the need of the parties in the administrative system to work together to realize their interests and goals in a mutually respectful way. Such an environment increases the need to include procedures that ensure that the interests of all parties are taken into account that the negotiation process is adequately structured and the negotiating power of stakeholders is addressed. The introduction of PPP and its institutes into urban planning derives from a real need that is formed by classical procedural legislation in relation to the authorities, and taking into account the interests of all parties to engage in the right to be heard, which is a key part of good governance.

PPPs are often mentioned in the context of privatization, but it is necessary to distinguish between the two concepts. Unlike privatization, PPPs operate on the basis of a joint decision-making process, of where public and private parties interests have been interpreted and defined in a contract or some other form of agreement (Held in: Sagalyn, 2007: 8). The Public Private Partnership Act (ZJSP 2006) defines PPP as "... the ratio of private investment to public projects and / or public co-financing of private projects in the public interest and concluded between Public and private partners in connection with the construction, maintenance and management of public infrastructure or other projects of public interest ...". With the Green Paper (2004: 3), the European Commission (EC) defines partnerships as: "cooperation between public authority and the business world, which is intended to provide financing, construction, reconstruction, management, maintenance of infrastructure or the provision of services".

PPPs based on the principle of »people in the first place«, ensure that people are key stakeholders. They focus on improving the quality of life in communities, especially in poor environments, and create local sustainable jobs that address food and health issues, strive for gender equality, regulate access to drinking water, energy, transport and education for all, encourage social cohesion and fair regulation, and try to eliminate all kinds of racial, ethnic, religious and cultural discrimination. PPPs are being promoted and expanded, as they gives people access to better services at more favorable prices.

Economic development and social welfare depend on the existence of effective and efficient infrastructure systems, particularly in health, energy, transportation and water, many of which are developed and managed through PPPs (Cruz, Marques, 2013). Whitfield (2010) provided a survey of PPPs around the world, showing how the model has been adapted to the economic, political and legal environments of different countries in Europe, North America, Australia, Russia, China, India and Brazil (KS et al., 2016).

PPP arrangements have emerged all around the world as a response to infrastructure deficits and the need to refurbish existing infrastructure. There is no unique and clear definition of PPP, but it is possible to summarize it as a procurement model for the provision of infrastructure and/or services. The public and private sectors engage in a contractual, or institutional relation to ensure that a certain infrastructure and/or service is available to citizens.

The vast literature on PPPs reveals at least up to 25 different types of PPPs (Romero, 2015: 12). OECD (2012) has highlighted that “there is no widely recognised definition of PPPs and related accounting framework”. Similarly, the International Monetary Fund (IMF, 2004) noted: “There is no clear agreement on what does and what does not constitute a PPP...The term PPP is sometimes used to describe a wider range of arrangements”.

## **2.1. PPP in business and cities competitiveness**

Cities are facing various challenges in this millennium: investing in competitiveness by promoting existing economic activities, innovation and creativity, and attracting foreign investment while achieving the vision of a high quality model of life, especially in the case of good practice in sustainable urban development. These challenges or contradictions are most evident in Europe, where they face major economic difficulties in the urban environment.

Sustainable urban policy can only be implemented in the modern world through interdisciplinary and transdisciplinary approaches. Urban paradigms are being introduced, introducing important new themes such as environmental ethics, transition from anthropocentrism to ecocentrism, participatory spatial planning, integral space and natural resources management, sustainable land use, environmental aspects (sub) of urbanization, and so on.

In the framework of the implementation with the use of guidelines for the sustainable planning (integrated investment potential), we need to provide forms of co-participation of public funds and private investments (PPPs). Only to facilitate partial interests of individual companies or individuals legally correct, but not legitimate, changes are made in the type of land use of business zones, residential areas and transport centers to hybrid shopping centers of mass consumption that are being sown without analyzing the consequences for integrated urban or settlement development (Premzl, 2002: 93). In the framework of valuing market mechanisms and the needs of society (demographic development, migration, purchasing power, housing preferences, etc.), the “action” and “management” plan for the implementation of individual projects by cutting financial resources has a key role in the implementation of SUS .

PPPs in urban development can be best defined as a true partnership of public officials and private developers who “have development ambitions that they could not complete alone” (Sagalyn, 2007: 8). In this form of public (municipalities) and private sector (private companies such as construction and property development firms, private banks, investment companies, etc.) cooperation, the aim usually is to accomplish a public task or a project by funding and/or operating on the basis of a partnership in which the financial risks of the public sector are to be reduced. PPPs were driven by limitations in public funds to cover investment needs and by efforts to increase the quality and efficiency of public services (EC, 2003).

### **3. Slovenian Spatial Characteristics and Planning**

Characteristic of Slovenian settlement is the disproportionately large number of settlements and built-up areas in relation to the number of inhabitants and surface area (20,273 km<sup>2</sup>). At the end of 2011, there were in total 6,030 settlements (source: Si-Stat Data Portal), where settlements with less than 100 inhabitants prevailed (2,872 settlements (or 47.7%) with a total of 6.6% of 2,056,878 inhabitants). There are 93 small and medium sized towns (Zavodnik et. al., 2008), which are supporting polycentric urban development. The central statistical region of Slovenia (which include the city of Ljubljana) has been on the date of 1.1.2011 the most populated region in Slovenia - 26% of all Slovenian population (Dolenc et. al., 2013). More than two-thirds of the inhabitants of this region have lived in the urbanised areas. The Municipality of Ljubljana (MOL) has 285.857 inhabitants (source: Si-Stat Data Portal), the density of the population per km<sup>2</sup> is 1.029,1 (source: SMRS), which reflects 13,87 % of population in Slovenia. The whole area of MOL covers 274,99 km<sup>2</sup> (source: SMRS). The capital city of Ljubljana is the largest urban area in Slovenia.

In the period after 1967 (Regional Spatial Planning Act) to this date, the doctrine (baselines, objectives, methodology) of spatial planning was significantly influenced by the following three parameters (Čok, Fikfak, 2015): 1) continuity of spatial zoning, which provided the conventional perception of planning; 2) economic impact of investments, which replaced the former doctrine of implementing spatial plans in line with social and development goals of sectoral policies, and 3) implementation of sustainable planning principles, where the elements of energy performance of buildings are prevalent, while other sustainable parameters are relatively neglected.

Ownership structure and free market conditions necessitate the implementation of many spatial developments (e.g. re-urbanisation, reuse) today. They are essentially based on the processes of urban development as urban green infrastructural, climatic urbanism, adaptive planning, including trends of sustainability and resilience challenges.

#### **3.1. PPP tool in Slovenian spatial development**

PPP plays an important role as an instrument of planning and implementation of public infrastructural projects, including urban projects that affect the dynamics of urban development. PPP sector in Slovenia remains underdeveloped. The Public-Private Partnership Act (ZJZP, 2006) was only adopted in 2007.

Slovenian planning legislation states that the main objective of spatial planning is to enable coherent spatial development by the consideration and coordination of different development needs and interests and assuring public benefits, especially in the areas of environmental protection, the conservation of nature and cultural heritage, etc. The problem in facing this challenge is in the actual realization of different urban projects which is often hindered due to the financial obstacles.

The PPP tool has been introduced into Slovenian spatial development practice rather recently. Most often different improvement in quality of the living environment are achieved by the implementation of PPP, which also contributes to a more controlled creation of urban space and increases the flexibility of the traditionally rather ossified planning process in Slovenia. The paper presents the most common forms of PPPs used in Slovenia. The lack of regional administrative level and due to division of Slovenia to 212 small municipalities on a local level, the country has a specific pattern when implementing PPP practice. In general, there are few PPP projects that exceed the threshold value to apply for some European Funds (EU) funds available for example in the new EU Investment Plan.

Spatial and urban planning have well developed tools to control forms and functions of space at their disposal, nevertheless Slovenian practice faces a lack of tools for implementation of such control. In the condition of limited public funds for management of space, and its infrastructure, the initiative is to a greater extent taken by the private sector. There is a need, and a must, for the profession to quickly develop and start implementing the mechanisms that will assure, in cooperation with the private initiative, the quality of final product within changed socio-economic circumstances. By revealing the tools appropriate for Slovenian spatial and urban planning context the project importantly contributes to the development of the profession that will be able to upgrade its set of management tools.

The main goal of this research project is to define decision-making system of priority interventions, that must be done with PPP. The research is based on the analysis of the Strategies of Smart specialization and analysis of adopted SUS and examples of successful and unsuccessful practice in city municipalities. For this purpose, semi-structured interviews were conducted with representatives of relevant municipalities departments and municipalities services. The main goal of the interviews was to determine the level of the current practices in the PPP in Slovenia and to identify different models of PPP that are in use in Slovenia. Special interest was given to the identification of possible urban development projects that can be implanted by the usage of PPP in future.

As a good practice of PPP implementation on a local level the paper presents a specific example from Ljubljana, Slovenia, where local authority with the collaboration of private partners ensured more than 400 sheltered apartments in the last years. In this way city authority is facing the challenges of ageing population and ensuring the services needed. Such an example was chosen due to the reason that ageing population in Slovenia, and Western societies in general, combined with the lack of public funding available for the provision of adequate services, might become an important issue.

## 4. Methods and Tools

The research conducted deals with the given topic comprehensive and interdisciplinary, with the integration of practical knowledge from different fields, such as: Urbanism, Architecture, Landscape Architecture, Spatial planning, Administration, Law and Economy. The aim of this research was to identify urban projects appropriate for PPPs in Slovenia. Comparable project, national as well as international, have been taken into consideration while trying to determine the current level of PPPs in Slovenia. The working method has been oriented towards a review of sites developed by PPP and the urban dimension. The research was focused on the 11 Slovenian city municipalities.

The following research methods were implemented in this study:

- Analysis of spatial planning documents and PPP legislation in Slovenia,
- Data collection and analyses of case studies from European countries with long tradition in PPPs,
- Analyses of SUS adopted in 11 city municipalities and identification of different types of urban projects that are suitable for the implementation as a PPPs,
- Interviews with representatives from city municipalities,
- Interviews with selected representatives of private and private investors,
- Field work,
- Inventory of development incentives, ongoing and finished PPPs in Slovenia,
- Detailed analyses of several case studies of PPPs in Slovenia (and Europe).

The results of the analyses of relevant documents and literature was the starting point for the definition of urban projects, suitable for PPPs. The set of urban projects is typologically segmented according to those selected aspects:

- The ability to manage processes of planning and implementation in Slovenian space,
- Usefulness of existed and potential financial instruments,
- Possibilities of incentives for increased private capital initiative,
- Fulfilment of business/ecological and urban/spatial goals.

Semi-structured interviews were used to collect data about PPPs in details. The interviews were conducted in the form of informal talks with different representatives of local public administration from December 2016 to the end of January 2017. The answers were analysed and structured in short reports in which we presented the main findings and common features, valid for the majority of the city municipalities, such as: 1) key motivations for the application of the PPP mechanism; 2) assessment of the suitability of the legislative framework; key obstacles to the implementation of PPP; 3) financial aspects of the implementation of PPP and forms of incentives for a

larger participation of private capital; 4) key open questions and dilemmas and guidances for improvement of the existing PPP system.

The results were additionally analysed in regard to three main topics:

- the value of PPP for local community,
- the value of PPP for society,
- the value of PPP for real sector.

Paralell to the interviews, we have closely examined several case study project (in Slovenia and Europe), of which we present one, the development of sheltered housing in Ljubljana. The example shows the relationship between public and private partners in terms of good architecture and urban practice. Through the examination of this PPP different approaches to activate land or buildings in public ownership with private capital was recognized, risks, benefits and potential problems revealed and possible solutions to overcome the obstacles identified. At the same time the example shows the relationship between public and private partners in terms of investments, responsibilities and benefits during the realization of an urban PPP project.

## **5. Example of local level PPP**

Based on the analyses of PPPs in Slovenia we adopted the term local level PPP. Due to the spatial legislation, settlement structure and the current practice of PPP in Slovenia the high majority of PPPs are relatively small, as none of the projects completed until now exceeds the threshold value for the application to EU funds available in the new EU Investment Plan.

Slovenia can be treated as an example of the bottom-up approach in PPP when talking about how PPP projects grow and evolve. The evolution of PPP projects goes from the “community that recognises a development need and works together to create the PPP to which more members join” (ENISA, 2011). Slovenia is missing a central specifically designated office dealing with PPP that would facilitate the PPP process. At the same time, central guidance is needed for municipalities (and all included in PPP process), when encountering specific problems dealing with PPPs. The public sector organisations “should consider the successful strategy used by many PPPs, by starting with a top down approach and over time start developing such projects from the bottom up” (ENISA, 2011).

Through the analysis of the case study the risks and rewards in the Slovenian sociological, spatial and economic reality are assessed, while ideas on how to create a more fertile environment for the implication of PPP driven projects are developed. The method of analysis is confirmed by the recognition of the need of implementation of smaller PPP projects that follows real life social needs of society.

## 5.1. Case study – Construction of sheltered housing for the elderly in Ljubljana

A detailed research has been carried out on the case study of a small scale project for a nursing home “Mijaks”. By the assessment of legal, administrative and financial aspect as well as the technical features of the project it can be fitted into the range of smaller scale PPP's of local relevance. This assessment directly implies that local contractors are more motivated to apply to the public tender than larger players from international spheres. The realization of the project within this framework shows also the local influence in the urban space, the effects on the social structure and economical effects.

A total of 54 sheltered apartments with satellite programs have been built totalling 4.477.76 sqm within the contractual value of 5,498,684.00 eur (VAT excluded). The PPP model adopted was a clear DFBTO (design-finance-build- -transfer-operate) where the Public Housing Financing Fund of the Municipality of Ljubljana is the public partner. The basics of the contract defined: the total gross area of the sheltered apartments that are to become part of the public part of the project / the market established value of the rent cost for sheltered apartments are to be offered in the private part of the project / the sales value of the sheltered apartment is to be conceded to the private partner.

The location for the project is procured by the public entity and the concession for the procurement of the project, under tender rules and requirements, is granted to the private entity. The private entity is required to procure supplies for both the public and the private part of the building while under operation under concession. Most of the economic risks concerning the implementation of the PPP agreement are transferred to the private partner. Ten of the total 54 sheltered apartments with the proportional percentage of common spaces are transferred to the public entity under official market valuations. A floor property agreement is processed between the private and the public partner after building completion following rules established in the tender. By this the rights and duties towards the maintenance and administration as well as the decision-making is shared in corresponding shares, while the ownership of the land and the rights and obligations that are associated with ownership are kept by the public partner.

A successful administrative and financial completion of this first project, with the adoption of this specific PPP model, has been interpreted as a good pilot project for both the public and the private partner. Longer-term cooperation with all the benefits for all parties involved is a model that might be mimicked by other municipalities in Slovenia. More than a mere financial interest of both parties have been met. The effects of this project are wider. Urban space is affected, infrastructure had to be adjusted, and suitable accommodations for elderly people has been established. Moreover, an example of good PPP relationship has been set. As projects are being assessed as successful or not from the strict point of view of financial effects and other measurable attributes it is often forgotten that other types of evaluation are also mandatory. In the case of the “Mijaks” nursing home this has not been done. There is no doubt about this project being a success from all the measurable aspects, but it is also necessary to emphasise that the financial success has been accomplished by at the expense of the urban context. Urban scale has been disregarded in this case as the building with its 4.477.76 sqm gross built area spanning over a ground floor and three additional floors is in evident contrast with the urban structure of the surrounding

area. This intervention along with some other isolated examples that are changing the existing urban structure, has been a focal point of solely academic discussion concerning the urbanisation of the “Dravlje-Šiška” district among urban planners in the last year.

## 6. Results and discussion

As a result of interviews it has been possible to identify a set of frequent and common issues both in the phase of the decision making about using a PPP for a project development or after the project has been commenced by means of a PPP.

In the initial phase, where the public entity is in the process of selecting a proper way to carry out a project, three crucial factors has been identified as a prerogative for opting a solution within a PPP: 1) the relieving of the public budget and therefore a situation where more than one crucial projects can be carried out within the same time period, 2) the shorter time-span needed to complete these projects and 3) the rationalisation of the number of public employments while holding a high level of standards.

The public partners have found it challenging to administer and finish projects in the critical years during the economic recession as private contracted partners have been greatly affected by it on the national level and thus have found sometimes insurmountable difficulties and were not able to see through all the contractual duties.

The information gathered through interviews, with private partners, showed a wide interest of companies to get involved in PPPs. A complicated and unsuitable regulatory system and a lack of specific financial incentives has been identified as the main concern while deciding for involvement in PPP. Overvaluation of public positions has been the rule in the public tenders for PPPs and thus many have failed to find interest from private partners. As ten years ago, the PPPs has found its way in the Slovenian legislature financial instruments, has not been adjusted to motivate this new development option. PPPs has been also a method of depicting a good public image of the private partners and show that the final return on value is not the only motivator.

A general misconception of the PPPs has been discovered in the research process. While both public and private partners are predominantly pragmatic while deciding to enter in a process of PPP, or carrying out the duties after a contractual agreement, it is the opinion of the general public that is much more unforgiving. PPPs are usually perceived in a negative way by the general public. It is most likely that socialist heritage of the »absolute common good« it what still makes a »private profit« unacceptable in Slovenia. As a result it has been difficult to push forward PPPs projects by many municipalities due to this mental state.

In Table 1 a SWOT analysis is presented with the evaluation of the local level sized PPP in Slovenia.



STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> <li>➤ Activation of local financial and business resources,</li> <li>➤ Improved incentives to markets and local economy currents,</li> <li>➤ Establishment of a long-term local level partnership,</li> <li>➤ Better understanding of local expectations and specifics,</li> <li>➤ Better oversight during the building/construction phase,</li> <li>➤ Better control and enforcement of higher standards (urban, architectural and later on operational),</li> <li>➤ Better control of »unexpected costs« and imposition of real tolls to finance the project,</li> <li>➤ PPPs on local level avoid entering a situation with cultural gaps (informal relations),</li> <li>➤ Simpler administration during the concession period,</li> <li>➤ Faster project completion i.e.quick delivery of the project, ect.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Selection of suitable and competent private partners might be narrower,</li> <li>➤ Small projects do not exceed the margin values for EU financing,</li> <li>➤ High capital cost, with insecurities on being granted a concession to the private partner,</li> <li>➤ Risk of non-completion of the urban project because of the small private partner – vulnerability due to markets fluctuation,</li> <li>➤ Dependence of small private partner on the current work might affect the completion of the project,</li> <li>➤ Expertise lies mostly on the private partner – assuring expertise on the local level might be difficult, ect.</li> </ul>
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> <li>➤ Better control of the risks in all stages of construction and also during the concession phase,</li> <li>➤ Better chances to implement innovative and creative solution due to small scale projects (less dangers because of smaller investment),</li> <li>➤ More chances for local business due to limited funding required for smaller sized projects,</li> <li>➤ Facilitating local private partner ensures job preservation,</li> <li>➤ Relieving the debt of the public treasury – possible to develop more than one projects within the same mandate,</li> <li>➤ Local level PPP are a good method to find consensus for infrastructural projects and also their promotion,</li> <li>➤ Establishment of a long-term local level partnership,</li> <li>➤ Creating a competitive business environment on the local level,</li> <li>➤ Improved incentives to markets and local economy currents,</li> <li>➤ public funds re-directed to other important socio-economic areas within the local community,</li> <li>➤ Return on investment (ROI) may be greater (larger % but smaller final financial benefits = better wealth and funds distribution on local level), ect.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Short term efficiency gains might be at the risk of inefficient dynamic efficiency in the long term,</li> <li>➤ Small PPP might not be able to adapt fast enough to changing situations on the socio-political level as well as economic,</li> <li>➤ PPP might transfer public jobs to the private sector,</li> <li>➤ If the contract is shared among more private parties, there is a risk that the administrative efforts on each side will be frustrated by a lack of co-operation on the part of one or both of them,</li> <li>➤ If local private partner is financially too exposed in the specific project the risks are greater for both parties / transferring risk or contract to another party might have a high price/risk, ect.</li> </ul>

Based on the information gained we identified the PPP-model-based urban projects that can, and the ways in which they are able to, contribute to the dynamic and controlled urban development.

**1) Value for the society**

Successful implementation of local level PPPs in spatial planning can largely contribute to the general well-being. In short terms such partnership can rise the spatial qualities by proper spatial solutions. In a long term while taking into account all the measures of sustainable development they can set new opportunities and potentials of future development by managing the resources accumulation (capital, knowledge). By setting clear criteria that PPP projects in the field of spatial development must take into account, this research project contributes to a development that will be beneficial to the generations implementing PPP projects as well as generations to come.

**2) The value for local community**

By a system of a comprehensive evaluation of urban planning based on SUS and smart strategies (S4), the future evaluation of spatial interventions will have much better rootedness in professional terms and in terms of the reasonableness, necessity and benefits of individual measures. The system of evaluation and concept of method for definition of urban projects appropriate for PPPs will assure that the measures will not be implemented one-sided and short-term only, but will - having in mind the comprehensive spatial, administrative and time overview of state of art - suggest guidance for definition and setting up of PPPs, that will take into account users, economics, long term and sustainability aspects.

**3) Value of the project for real sector**

The project contributes to the development of 1) communal infrastructure, 2) development of economic fields, 3) preservation and protection of cultural heritage. Add 1) The conditions for the development of communal infrastructure have considerably changed in the last 25 years. Due to the atomised administrative structure of Slovenian territory (212 local municipalities), mainly small local communities are limited in the sources for development of communal infrastructure by the funds dedicated by the state or economic initiative which primarily seeks economic interest. The project contributes to the solving of the situation in the field of communal infrastructure provision by the analysis of typology of projects that are (un)suitable for implementation in PPP manner, as well as tools that are on disposal to local communities and providers of communal infrastructure to assure the fulfilment of public interest through the PPPs and reach the target standards of communal infrastructure. Add 2) Development of economic sectors is of an essential importance for survival and development of local communities and settlements (e.g. development of tourism sector, development of creative industries based on local natural resources such as wood), but often does not take place due to the lack of start-up means. By accumulation of public and private means the break-through are more likely to happen and can help establish such activities and their development. In such cases a successful lead of PPPs is of essential importance. Add 3) Preservation and protection of cultural heritage is financially and legally demanding exercise in historical parts of Slovenian urban environments. Limited financial sources of individual (public or private) investors are often not sufficient for quality and comprehensive renewal, therefore the renewals are partial and do not meet desired standards, or are not started at all

due to too big complexness which accelerate cultural degradation. Protection of cultural heritage is a well-established concept at a declarative level in Slovenia, but needs an institutional support with new means of implementation and realization in practice.

Based on the research conducted and the reviewed literature, specially the report from the Urban Land Institute from 2005 (Corrigan et al., 2005) some of the general main principles for successful PPPs were pointed out.

- Prepare adequately for public/private partnerships and create a shared vision,
- Understand your partners and establish a clear and rational decision-making process,
- From the start be clear on the risks and rewards for all parties,
- Secure consistent and coordinated leadership,
- Negotiate a fair deal structure,
- Communicate and build trust as a core value.

The municipality should be active and be prepared with a list of possible urban projects, which fulfil the first two requirements, principles and only then search for possible private partners. In this way the public authority would set the groundwork for successful joint ventures through careful planning and consensus building (Corrigan et al., 2005).

Multiple tools can be enforced for a creation of a better and friendly environment for PPPs, such as: 1) specific financial instruments for the implementation of PPPs, 2) training of designated public officials and 3) an organisation of a national advisory body that assist in the implementation of PPPs; and more than anything 4) a better legal structure that clearly enforces the PPPs as a strong development tool. There should be assistance on both national and local level to those interested in setting up or evolving partnership arrangements in order to help optimise the chances of success. Education and information sharing on local level with the dissemination of existing experiences from successful local level PPP is a necessity if to correct the present negative public image of PPPs.

The small scale PPPs positive aspects must be exploited and turned into opportunities to further attract private partner's cooperation in less developed locations in the country thus creating faster development in these environments.

## 7. Conclusions

If it is in the interest of the government of Slovenia within the countries specific situation, where more than often »local level« means also national level to promote the instrument of PPPs, further assistance and incentives must be ensured. Due to the small size of the country most of the project can be regarded as if of local scale and impact in the global perspective.

Public partners, Municipalities in this local sense, must have a clear vision on their development priorities and a clear plan on how and where to include private partners. It is necessary to pay a particular care, with the help of a proposed designated advisory body from the national level, in the selection of project types suitable for PPPs. Despite the existing legislation, where only the theoretical principles of spatial planning and PPP use are implemented, we noticed many interventions and PPP projects that cannot be contextualized in the broad spatial development framework. We would like to point out that the problem is not always connected to unnapropriate legislation, but it can be attributed to non-implementation, lack of knowledge, municipality inactiveness, missinformation, etc.

With all of these interventions and optimisations the PPPs can become a great development tool to secure sustainable and resilient development, after more than ten years after its introduction into the Slovenian legislature.

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## INNOVATION IN RETAIL: IMPACT ON CONSUMER BEHAVIOR. DETERMINANTS OF USE M-SHOPPING AND LOYALTY OF DRIVE SHOPPING USE

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*This paper presents two qualitative approaches dealing with the impact of two current innovations in retail : the M-commerce and the drive-in stores. Most research concentrate on the technology acceptance model but right now, this step seems to be overcome in France, for these two channels, M-Commerce and drive, already represents purchases for billions €. Each of these new ways of shopping has been chosen by different consumers' profiles. However similar reasons seem to have motivated their choice: winning more free time, better control of expenses and purchased goods or services, seamless shopping experiences. Few limits are also identified: low tangibility of the offered goods, perceived risks of Internet connection.*

Dès 1998, Zinkhan & Watson ont souligné que l'innovation dans le commerce de détail peut modifier profondément le comportement d'achat des consommateurs. « *quand les consommateurs adoptent de nouvelles technologies, leurs comportements changent* ». Depuis une dizaine d'années, deux changements majeurs sont intervenus en matière de distribution commerciale, tous deux impulsés par l'évolution de technologies de communication et d'information : l'utilisation de systèmes de « *drive-in* » et celle de la téléphonie mobile pour faire ses courses. Les deux recherches qualitatives dont nous présentons les résultats portent sur chacune de ces deux innovations. La première recherche s'attache à identifier les déterminants de l'utilisation du M-commerce (les achats par *Smartphone*), la seconde traite du problème de la loyauté des consommateurs utilisant le *Drive* pour faire leurs courses. Notre principale hypothèse est que le recours à ces nouveaux modes d'achat change en profondeur la façon de consommer des clients. Ces deux nouvelles technologies de vente introduisent, en effet, des possibilités inédites pour fluidifier les échanges entre les commerçants et les clients. Qu'il achète sur ordinateur ou sur mobile, le consommateur cherche à en tirer le meilleur parti et à en bénéficier au mieux pour sa vie quotidienne. De leur côté, les centres commerciaux traditionnels tentent d'attirer et retenir ces consommateurs de plus en plus informés et de moins en moins attachés à un lieu de consommation.

Le système *Drive* consiste à séparer en deux étapes la visite d'un magasin pour faire ses achats : la première étape se déroule sur Internet où le consommateur peut visiter le site du magasin virtuel, quand bon lui semble et sans souci d'horaire ; la seconde étape consiste en la livraison des achats effectués et payés en ligne. L'efficacité des deux étapes est nécessaire au succès de la formule et le temps consacré à la seconde étape a été comprimé autant qu'il était possible grâce à un système de préparation de commande et de rendez-vous planifiés pour le retrait des achats en un lieu organisé dans ce but, à la manière d'une station-service. Il s'agit là d'un exemple illustrant la logique combinatoire à l'œuvre dans les innovations du commerce de détail (Djellal ; Gallouj, 2005. Gallouj, 2007) : le *Drive* couple les achats par Internet et l'offre des supermarchés classiques. L'innovation du *Drive* permet aux consommateurs de maîtriser leurs achats, en contrôlant le prix des produits achetés, grâce à la commande passée via Internet, tout en bénéficiant de gains de temps et d'efforts, en fixant librement le jour et l'heure qui leur conviennent pour l'enlèvement des marchandises.

Le M-commerce recouvre des technologies beaucoup plus larges, tout en s'appuyant sur les boutiques virtuelles déjà conçues pour le *Drive* ou les livraisons à domicile. A la différence du système précédent, il est conçu pour une utilisation mobile, à partir d'un écran de petite taille, comme celui d'un *Smartphone* ou d'un *iPad*. Cette adaptation permet d'exploiter des données de géolocalisation et d'offrir au consommateur des informations immédiatement utilisables,



favorisant sa réactivité et sa rapidité d'adaptation pour saisir les meilleures opportunités. Il propose des solutions dans des domaines beaucoup plus étendus que l'offre des commerçants traditionnels, puisqu'on peut y organiser, outre ses achats courants, son transport, ses spectacles, les services de différentes natures que l'on souhaite. Il s'agit donc d'un outil plus flexible et dont il devient encore assez ouvert, ce qui peut expliquer que la plupart des travaux de recherche qui lui ont été consacrés (Amin *et al.*, 2014. Yadav *et al.*, 2016) concernent l'apprentissage et l'adoption de cette innovation et de ce nouveau mode d'achat. Nous ne suivons pas ici cette problématique qui nous semble dépassée par le développement actuel du M-commerce, du moins en France : ce sont les contextes d'usage des achats par mobile qui nous intéressent, ainsi que les changements induits dans les habitudes d'achat. Il importe, en effet, de prendre la mesure des changements de comportement induits par ces nouveaux canaux d'achat : le consommateur change, devient plus exigeant, mieux informé en permanence et la position du vendeur, son attitude, ses argumentaires, doivent s'adapter pour demeurer crédibles.

Le baromètre de l'e-commerce réalisé par *KantarWorldpanel* en collaboration avec le magazine *LSA* (2017) confirme l'importance de la tendance : 32,4 millions de consommateurs français ont effectué au moins un achat en ligne entre avril et décembre 2016. Cela représente, en moyenne, 12,2 achats durant ces 8 mois, avec un panier moyen de 59 €. Si on regarde la répartition entre les canaux de vente, l'ordinateur reste majoritaire (78 % du chiffre d'affaires réalisé en ligne), mais les canaux mobiles (*Smartphones* et tablettes) progressent et représentent en 8 mois plus de 5 milliards d'euros de chiffre d'affaires (22 % du total des achats en ligne). Nous ne sommes donc plus confrontés à des comportements de consommateurs innovants, mais à un véritable changement d'habitudes d'achat qui nous oblige à modifier notre regard et notre approche sur ce phénomène.

La démarche qualitative adoptée ici, est de nature essentiellement exploratoire. Son objectif est surtout de rester fidèle aux opinions recueillies et d'en faire émerger les thématiques et les variables que la poursuite de la recherche permettra d'opérationnaliser. Elle met déjà en évidence certaines constantes et certaines différences d'usage et de points de vue qu'il est intéressant de présenter. Dans le cadre de cette communication, nous avons largement laissé la parole aux consommateurs eux-mêmes en reprenant leurs *verbatim* les plus caractéristiques. Notre intervention consiste, pour l'essentiel, à les classer par thème et à les mettre en perspective. La méthodologie employée est présentée d'abord, puis les résultats de cette analyse qui, tout en restant très sommaire, montre clairement les motivations qui animent ces nouveaux consommateurs. La discussion conduite en conclusion mettra l'accent sur les questions que posent ces nouvelles pratiques d'achat pour les distributeurs traditionnels et sur l'impact qu'on peut attendre en termes de fidélité ou de volatilité des clientèles.

## 11. METHODOLOGIE

Deux enquêtes qualitatives ont été menées pour mieux connaître les utilisateurs de ces deux innovations commerciales, analyser ce qui motive leur choix, mais aussi ce qui les freine et, enfin, mettre à jour les variables qu'une analyse plus poussée devra prendre en compte. Le tableau 1 présente les personnes qui ont répondu à nos questions sur l'emploi du *Smartphone* pour effectuer leurs achats :

Tableau 1 Profil des répondants utilisant le M-commerce

Répondant	âge	Sexe	Profession	Pays d'origine
M-1	23	Masculin	Serveur de restaurant	France
M-2	29	Masculin	Serveur de restaurant	France
M-3	27	Féminin	Hôtesse d'air	Chine
M-4	27	Féminin	Etudiante (doctorat)	Chine
M-5	30	Masculin	Etudiant (master)	Chine
M-6	29	Féminin	Cadre de gestion	Chine
M-7	26	Masculin	Cadre de gestion	Chine
M-8	28	Féminin	Entrepreneur	Chine
M-9	56	Masculin	Cadre de gestion	France
M-10	33	Féminin	Etudiante (doctorat)	Chine
M-11	32	Masculin	Etudiant (master)	Chine
M-12	23	Féminin	Etudiante (licence)	France
M-13	26	Féminin	Cadre de gestion	Chine
M-14	35	Féminin	Etudiante (licence)	France
M-15	40	Masculin	Cadre de gestion	France
M-16	22	Masculin	Etudiant (licence)	France
M-17	20	Féminin	Etudiante (licence)	France
M-18	21	Féminin	Etudiante (licence)	France
M-19	40	Féminin	Cadre de gestion	France
M-20	33	Féminin	Cadre de gestion	France

Pour le M-commerce, nous avons conduit une série d'entretiens semi-structurés avec 20 personnes choisies dans notre réseau social de façon aléatoire, mais toutes devaient pratiquer ce mode d'achat mobile, utilisant leur *Smartphone* pour faire des achats. Ces personnes ont été interrogées en France et étaient d'origine européenne ou chinoise. Le choix d'interroger des personnes venant de Chine s'explique par le développement très rapide de l'utilisation des *Smartphones* dans les pays asiatiques, tout particulièrement en Chine. La qualité des sites Internet et leur adaptation au téléphone mobile expliquent sans doute le développement important qu'y connaisse ce mode d'achat.

Les entretiens ont été conduits en anglais : de ce fait, les *verbatim* reproduits plus loin sont en langue anglaise. Pour permettre une meilleure analyse des données, chaque entretien a été enregistré et intégralement retranscrit. Les répondants ont présenté une caractéristique remarquable : avec un âge moyen de 30 ans, 95 % sont jeunes (pas plus de 40 ans), avec une prédominance pour la tranche d'âge 18-34 ans, un seul répondant a plus de 50 ans et six autres se situent entre 31 et 41 ans. Un biais d'échantillonnage est toujours possible, cependant, l'exigence de trouver des répondants qui aient cette pratique du M-commerce a été une contrainte forte qui explique probablement cette caractéristique (Zhang, 2016).

Les entretiens ont été conduits en deux étapes. Dans un premier temps, nous avons demandé aux répondants s'ils avaient déjà effectué des achats avec leur téléphone, quel type de produits ils recherchaient, et s'ils utilisaient des applications de commerçants. Ensuite, nous leur avons demandé quand et où ils utilisaient leur *Smartphone* et quelles fonctions étaient les plus utiles pour eux. Puis, afin de comprendre le contexte global de leur achat, nous leur avons demandé de décrire plus précisément :

- Une situation où ils ont utilisé une application de commerçants.
- Les raisons de leur utilisation et la satisfaction qu'ils en ont tirée.
- Quel service par *Smartphone* leur semblait le plus utile ?
- Quels étaient les avantages et les défauts des applications d'achat par téléphone ?

Dans un second temps, nous les avons interrogés sur l'interaction qu'ils ont expérimentée à chacun des stades de leur achat. Concrètement, nous leur avons demandé :

- L'interaction expérimentée à chacun des stades de leur achat
- Comment ils évaluaient ces interactions dans leur expérience d'achat ?
- Comment ils percevaient le changement dans leurs habitudes d'achat ?

Pour la seconde étude qualitative, une démarche similaire a été adoptée : l'enquête avait pour objectif principal de montrer, d'une part, les caractéristiques des consommateurs de *Drive*, d'analyser leurs motivations et freins à l'achat et, d'autre part, de déterminer les facteurs qui contribuent à la fidélité des consommateurs de *Drive*. Les 16 consommateurs répondants ont été rencontrés sur le site du *Drive* de Carrefour à Aix en Provence. Les entretiens ont été individuels, semi-directifs, et ont duré entre 30 et 45 minutes. Comme pour la précédente enquête, chaque entretien a été enregistré et intégralement retranscrit. Leur profil est présenté dans le tableau 2.

En interrogeant des personnes sur le site d'un *Drive*, nous pouvons avoir une première idée du profil de ces utilisateurs (Wassouf, 2017). Tous appartiennent à une catégorie socioprofessionnelle assez élevée, en lien avec un niveau d'étude supérieur et ils sont en activité. Cette caractéristique est apparente au profil des e-consommateurs, tel qu'établi par Donthu et al. (2009). Selon ces auteurs, les e-consommateurs sont en général plus innovants que les autres et ils recherchent surtout le gain de temps et le côté pratique.

La seconde caractéristique majeure des répondants est qu'il s'agit, à une exception près, de personnes vivant en couple et même (à deux exceptions près) de familles avec des enfants, (deux fois plus souvent). Enfin, l'âge moyen des répondants est de 37 ans, aucune personne

âgée (âge maximum 50 ans), aucun très jeune non plus (âge le plus faible, 28ans). Selon les travaux qui ont été menés sur l'effet de l'âge sur la fidélité des consommateurs (Chung, Holdsworth, 2012), les personnes de moins de 45 ans seraient des clients plus fidèles que les autres segments d'âge. En outre, les répondants, en majorité, vivent ou travaillent à proximité du *Drive* qu'ils fréquentent.

Tableau 2 Profil des répondants utilisant le *Drive*

Répondant	âge	Sexe	Profession	Situation de famille
	(ans)			(Nombre d'enfants)
D-1	33	Féminin	Comptable	Concubinage (2)
D-2	41	Féminin	Professeure des écoles	Mariée (2)
D-3	34	Féminin	Chef de projet, traductrice	Mariée (1)
D-4	50	Masculin	Enseignant	Pacsé (3)
D-5	36	Masculin	Gestionnaire (université)	Marié (2)
D-6	38	Féminin	Pharmacienne	Concubinage (1)
D-7	38	Masculin	Ingénieur	Marié (3)
D-8	34	Féminin	Ingénieur informatique	Concubinage (2)
D-9	36	Masculin	Huissier	Marié (2)
D-10	40	Féminin	Enseignante	Mariée (1)
γ D-11γ	35γ	Fémininγ	Contrôleuse de gestionγ	Pacséeγ(2)
D-12	31	Masculin	Comptable (collaborateur)	Marié (0)
γ D-13γ	28γ	Fémininγ	Manipulatrice-Radio(hôpital)γ	Célibataireγ(0)
D-14	33	Masculin	Fonctionnaire	Marié (2)
D-15	40	Masculin	Gestionnaire	Marié (2)
D-16	37	Féminin	Enseignante	Mariée (1)

## 12. RESULTATS

Trois thèmes ont émergé des entretiens et sont consacrés aux avantages de ces innovations : l'enrichissement du temps, la rationalisation des courses, une expérience de consommation « sans couture ». Ces trois thèmes se retrouvent évoqués, tantôt par les consommateurs de *Drive*, tantôt par les utilisateurs du mobile, souvent par les deux.

Au-delà, les entretiens ont mis en lumière des sujets générant des inquiétudes et susceptibles de freiner le recours à ces canaux d'achat. Le principal sujet concerne les deux recherches : il s'agit de l'effet de la dématérialisation des produits vendus qui perdent un peu de leur attractivité par rapport au contact direct qui n'est possible qu'en rayon. Deux autres soucis concernent surtout la technologie mobile : des questions restent posées quant à sa sécurisation, à l'extension et à la fiabilité de la réception d'Internet en tout lieu.

## 2.1. L'enrichissement du temps par la libération du temps contraint

Pour les consommateurs, le premier attrait que présentent ces deux innovations commerciales concerne la gestion du temps : l'innovation fait gagner du temps sur ce qui est perçu comme une contrainte, symétriquement, elle permet d'enrichir le temps rendu disponible en le consacrant à d'autres activités mieux prisées. Quel que soit le volume effectif de temps ainsi gagné, ce qui paraît compter le plus, pour les clients, c'est qu'ils en reprennent la maîtrise ; Ils ressentent donc bien d'une libération du temps et une reprise de contrôle qui va dans le sens de l'*empowerment* du consommateur (Wathieu *et al.*, 2002).

### 12.1.1. Diminution du temps contraint

Cette économie réalisée sur un temps contraint est particulièrement soulignée par les utilisateurs de *Drive* :

« Les courses c'est la perte de temps pour moi. Le Drive me permet de faire d'autres choses » (Répondant D-1)

« Passer une heure et demie ou deux heures pour remplir le caddie, c'est perte de temps » (Répondant D-9)

« Quand on passe beaucoup de temps au bureau, on n'a pas envie d'en passer autant pour faire les courses ! Voilà pourquoi je passe régulièrement chez Carrefour Drive ! Les courses sont faites en quelques minutes sur le site et en quelques minutes c'est dans le coffre » (Répondant D-15)

« Chercher à manger et après, ...c'est un petit peu une corvée ! Mais c'est vrai que depuis que je fais mes courses en Drive, c'est vraiment agréable » (Répondant D-2)

« Les courses en supermarché : une corvée » (Répondant D-4)

« Un pensum pendant la semaine, les courses en supermarché, mais maintenant ça va beaucoup mieux avec le Drive » (Répondant D-6)

### 12.1.2. Maîtrise du temps

« En fait, si je me fais livrer à domicile, je suis obligée d'être présente chez moi, en plus il y a toujours des retards par le livreur, euh, donc pour moi, j'ai pas le temps quoi ! Mais avec le Drive je peux gérer et maîtriser mon temps » (Répondant D-1)

« C'est moi qui maîtrise le temps, parce qu'en faisant le retrait, comme je fais actuellement en Drive, ça me laisse une amplitude horaire bien plus large » (Répondant D-13)

### 12.1.3. Enrichissement du temps libre

En libérant du temps, les nouveaux modes d'achat permettent de l'employer à d'autres activités, ou plus simplement à mieux gérer le temps que l'on passe à s'informer sur les produits en vente car cette étape peut trouver sa place n'importe où et dans n'importe quel interstice laissé libre par la vie quotidienne. C'est relevé par les utilisateurs de *Drive*, mais aussi les usagers du mobile :

« C'est bien de passer du temps dans le supermarché quand on n'a rien à faire, mais si on a d'autres choses à faire, on préfère le Drive, c'est plus pratique » (Répondant D-3)

«C'est du temps qui est mieux utilisé, parce qu'on peut faire d'autres choses, on peut rester à la maison et prendre un café et regarder les devoirs des enfants, ainsi, on participe à la vie familiale » (Répondant D-7)

«I am so glad to use my Smartphone when I have little time between work and other activities. For example, I could watch the products and promotion information when I go to the toilet or when I take a little rest between my work times. This is really useful for me to notice and capture the new products because I don't have enough time to go to store every day. I used to be bored when I go to the toilet, but now I feel I could stay there for the whole afternoon » (Répondant M-7)

## 2.2. Rationalisation des courses

Certains consommateurs perçoivent dans ces innovations commerciales une solution leur permettant de mieux maîtriser leurs dépenses, en évitant des achats non planifiés, voire impulsifs. La commande *via* Internet permet, en effet, au consommateur d'aller à l'essentiel et d'acheter uniquement ce dont il a besoin, donc de mieux contrôler ses achats. De nouveaux parcours d'achat émergent également qui s'accompagnent d'une recherche d'informations plus systématique, des décisions d'achat plus rationnelles et mieux contrôlées par le client. C'est un plus pour le consommateur, mais c'est aussi une remise en cause du modèle de vente des hypermarchés où le consommateur est mis en condition d'achat par un environnement très étudié. Le consommateur maîtrise mieux ses choix et est beaucoup mieux informé, notamment en ce qui concerne le prix des produits.

### 12.2.1. Maîtrise du choix

Cet aspect a surtout été mentionné par les utilisateurs de *Drive*. En effet, cela correspond bien à la logique de ce système où l'on peut, « tranquillement » faire ses emplettes sur son écran chez soi, sans subir autant de pression ou d'influence de l'environnement commercial. Sur Internet, l'environnement virtuel est plus neutre et son influence nécessairement moins puissante car il n'est pas exclusif et ses effets se combinent à ceux du milieu non virtuel dans lequel les boutiques virtuelles sont visitées.

« Je fais des économies car je sélectionne ce dont j'ai besoin, et je ne m'égare pas dans les rayons » (Répondant D-11)

«Ça me permet de pas acheter de bêtises. Ça évite justement des gaspillages car on n'achète que ce dont on a besoin » (Répondant D-12)

«C'est une bonne manière de maîtriser les dépenses du quotidien sans être tenté par des achats inutiles» (Répondant D-6)

«Je ne suis plus tentée de prendre tout et n'importe quoi, comme je le faisais avant, en passant dans chaque rayon, les promotions sont visibles dans une catégorie, sans besoin de chercher » (Répondant D-3)

«Je ne vais plus au magasin depuis que j'ai découvert le Drive !! On ne dépense plus son budget car on achète vraiment ce dont on a besoin » (Répondant D-5)

Les acheteurs par mobile sont plus dans l'instantanéité et l'impulsion et ont peu mentionné cet avantage en termes de contrôle du budget. Ils s'expriment plus en termes d'efficacité à obtenir le meilleur prix.

### 12.2.2. Recherche de prix compétitifs

«I have just finished my study life at the university and I have a part time job in a restaurant, so I have a lot of time now. As I don't have a vehicle to go shopping,

*so I spend a lot of time on mobile apps. I can spend the whole day to compare the prices and put it in my purchase list, it's a kind of fun. » (Répondant M-7)*

*«The price is maybe the most important for me to use M-commerce. I found one pair of shoes which I really liked and very expensive in store, so I decided to search it with my mobile, I found the same thing with a very attractive price and I made the order very quickly » (Répondant M-2)*

Il faut noter que la recherche du prix le plus bas est souvent citée par les utilisateurs du mobile et, lorsqu'elle aboutit, elle déclenche aussitôt l'achat, de crainte que l'offre ne soit plus maintenue ensuite. Pour les acheteurs en *Drive*, la logique est différente : plutôt que les prix les plus bas, ils demandent simplement de bénéficier des mêmes prix qu'en magasin et d'y trouver des promotions similaires. Cela tient sans doute aussi à la différence des achats opérés : achats courants, répétitifs et standardisés en *Drive*, plus ponctuels, de plus de valeur et ciblés avec le mobile, ce qui justifie le temps consacré à la recherche du meilleur prix.

*«Je suis devenu un adepte de cette façon de faire ses courses, les prix sont comme en magasin » (Répondant D-4)*

*«J'utilise le Drive les semaines où je n'ai pas le temps de faire les courses en magasin. J'apprécie le fait d'avoir les mêmes prix sur le Drive qu'en magasin et la rapidité de retrait de mes produits » (Répondant D-14)*

*«Les articles sont au même prix que dans le magasin, c'est pratique pour les personnes qui n'aiment pas aller dans les magasins ou qui n'ont pas le temps » (Répondant D-9)*

### 2.3. Une expérience de consommation « sans couture »

Ces deux innovations changent la façon dont les consommateurs réalisent leurs courses : les boutiques virtuelles permettent de réfléchir et d'organiser ses achats à l'avance, le téléphone permet de s'informer juste à temps et d'optimiser ses déplacements ; le *Drive* donne la possibilité d'intégrer un bref arrêt pour achats dans un déplacement quotidien. L'expérience de consommation s'intègre ainsi, à la fois mentalement et physiquement, à la vie de tous les jours. Pour que cette expérience soit « sans couture », il faut une coordination parfaite entre le canal virtuel et le canal physique de chaque commerçant. Une offre alléchante, mais qui ne serait pas tenue concrètement détruit la continuité mentale qui s'instaure dans l'esprit du consommateur et l'amènera à considérer avec suspicion les promesses virtuelles faites sur Internet, sapant rapidement la confiance accordée à ce commerçant et, à la longue, celle conférée au canal d'achat.

Pour le consommateur, les premiers facteurs favorisant la perception d'une continuité entre le canal virtuel et l'enlèvement concret des produits sont la proximité et la praticité des formules d'achat. Les consommateurs mobiles introduisent aussi un autre aspect : l'immédiété de la consommation.

#### 12.3.1. Proximité

Variable essentielle du commerce, la distance définit traditionnellement les bassins de chalandise et les aires de marché des distributeurs. La proximité des installations reste un aspect essentiel pour le consommateur virtuel, dans la mesure où ce qu'il achète doit lui être fourni sans lui imposer de grands déplacements ni de longs détours. La continuité avec la boutique virtuelle a besoin de cette proximité, surtout lorsqu'il s'agit

d'achats répétitifs, comme dans le cas du *Drive*, mais ce facteur joue aussi, différemment, pour ceux qui achètent via leur *Smartphone*.

«*I don't have a car to go for shopping, it's not very convenient to take the bus to Carrefour every time. So I prefer to search and reserve products with my mobile and go to get it. That saves me a lot of time* » (Répondant M-6).

«*La plupart du temps, on prend le Drive à côté, c'est le plus proche de chez moi, on prend la proximité* » (Répondant D-9).

«*Une enseigne qui est sur mon chemin du retour de mon travail, c'est le Carrefour Drive* » (Répondant D-10).

«*C'est génial lorsqu'on travaille et finit tard, on clique et on passe au Drive. En 5 minutes c'est dans le coffre !! Bref, je recommande à toutes mes collègues* » (Répondant D-1)

### 12.3.2. Praticité

La praticité est un concept synthétique qui mêle et résume différents aspects de l'expérience : si une formule est jugée pratique ou commode, c'est qu'elle ne pose aucune difficulté et qu'elle permet aussi un gain de temps, d'efforts ou d'argent. Il n'est donc pas étonnant que les consommateurs associent le côté pratique avec la meilleure maîtrise du temps que permettent les courses en *Drive* ou par mobile. Ce qui est jugé pratique, c'est aussi la commodité d'accéder aux sites depuis chez eux (ou ailleurs) et de passer leur commande sans avoir de souci sur la suite qui lui sera donnée. Ce qui nous intéresse ici, c'est qu'en trouvant cette façon de consommer pratique, le consommateur lie implicitement commodité et bonne coordination :

«*C'est très pratique ! Voilà, en une demi-heure, trois quarts d'heure, je peux chercher mes courses, je les range* » (Répondant D-5)

«*Voilà, c'est super rapide ! Et quand on achète en Drive, ça va super vite ! C'est super de pouvoir commander de chez soi car on peut prendre son temps, ne pas courir partout.* » (Répondant D-14)

«*Quel bonheur de pouvoir faire mes courses devant mon canapé et sans attendre à la caisse ! Un gain de temps considérable !* » (Répondant D-7)

«*Le Drive de Carrefour est vraiment très pratique et me fait gagner un temps énorme* » (Répondant D-2)

«*Carrefour Drive est très pratique, ça me permet de gagner beaucoup de temps et d'avancer dans notre emploi du temps, sans perte de temps* » (Répondant D-8)

«*Un gain de temps pour les pressés. Plus besoin de courir dans les supermarchés ! Il vous suffit de passer commande en ligne, d'indiquer l'heure à laquelle vous voulez récupérer votre commande et ensuite aller chercher tout ça. On vous mettra directement vos courses dans votre coffre !* » (Répondant D-15)

«*Les courses, c'est corvée pour moi ! Le Drive me permet de faire d'autres choses, c'est extrêmement pratique* » (Répondant D-4)

«*Avec ma poussette dans les rayons, c'est trop compliqué de pousser le chariot en même temps. J'achète tout, les couches, le lait, les lingettes, l'eau... C'est très pratique, je ne retournerai jamais plus en magasin* » (Répondant D-3)

«*J'aime bien, j'aime bien Carrefour Drive, on trouve facilement l'adresse du site de Drive, on peut passer la commande à tout moment* » (Répondant D-6)



«Ce service est vraiment très pratique, quand on est, comme moi, une maman très active avec deux enfants. Le site est facile d'accès, la navigation aussi, et on retrouve les promotions du magasin » (Répondant D-11)

«C'est tout le temps possible de se connecter à ce site de Drive, ainsi c'est facile de passer la commande, c'est clair et simple d'utilisation » (Répondant D-9)

«Oui c'est simple de rechercher de l'information, c'est simple d'accéder au résultat que l'on souhaite » (Répondant D-12)

« Je suis toujours ravie de faire mes achats sur ce site. Il est très facile de naviguer entre les différentes pages, d'ajouter ou de retirer des articles du panier. Et en cas de souci, nous avons toujours la possibilité de les joindre par téléphone » (Répondant D-10)

«Les courses au Drive nous simplifient la vie. Plus rapide et moins stressant. Le site est très bien d'un point de vue ergonomique. Je n'ai jamais eu de problème lors de mes commandes et j'en suis très content » (Répondant D-14)

«Carrefour Drive, c'est mon endroit préféré pour faire les courses, le site est très clair et très facile d'utilisation » (Répondant D-5)

Pour les utilisateurs de *Smartphone*, le côté pratique tient beaucoup à la facilité d'accès à l'information dont on a besoin, à tout moment et en tout lieu ; les possibilités de paiement par *Smartphone* sont également citées :

«We were in this small town and we don't know where we could find the store, so Nicolas used his phone to find a Casino which was at 10 minutes from us. We were so happy because otherwise we would have nothing to eat for that night » (Répondant M-15)

«It's useful to use the store model because I could find what I want quickly. And I can use my phone to scan the product for more information, when I find it. Like a bottle of wine, I can't find the price and I scan it with my phone, the price came up » (Répondant M-10)

«Payment is easier than before, I don't have to bring my wallet every time I go to shopping ». (Répondant M-1)

### 12.3.3. Immédiateté de la consommation

Cet aspect est visiblement une autre dimension de la satisfaction des consommateurs utilisant leur téléphone portable pour leurs achats : pouvoir acheter vite et voir rapidement son achat se concrétiser constitue sans doute aussi une facette d'une expérience d'achat « sans couture ».

«The promotion they sent me is very interesting because they seem to know what I'm looking for. For example, I needed to buy a print machine, two weeks ago, which I searched it a lot for the best price. And then the Carrefour sent me a list of printers with promotion, I was so happy and surprised that I found it this way » (Répondant M-11)

«I found one pair of shoes which I really liked and very expensive in store, so I decided to search it with my mobile, I found the same thing with a very attractive price and I made the order very quickly » (Répondant M-2)

## 2.4. Freins et limites à l'extension

Les consommateurs par mobile, comme ceux du *Drive*, sont confrontés à la dématérialisation de la relation commerciale ainsi qu'aux questions de sécurité liées aux transactions en ligne. Les consommateurs sont plus ou moins contraints de faire confiance à l'application, qu'elle soit logée sur leur téléphone ou leur ordinateur. Enfin, le M-commerce voit ses promesses mises en question lorsque l'on se trouve dans des zones où le signal est faible ou inexistant. Le mode de vie « mobile » rend étroitement dépendant d'une couverture internet complète et sûre.

### 12.4.1. L'immatérialité de l'achat

L'achat en ligne introduit une certaine dose d'incertitude, qui est amplifiée du fait de la petite taille de l'écran du téléphone : ce n'est pas chose aisée d'y comparer les produits offerts par différentes boutiques.

*« Mobile screen is too small so I can't compare different products with it, and I don't want to take my I-Pad every day because I live in Marseille, it's very risky to do that »* (Répondant M-11)

*« Mobile screen is also an inconvenient point for me, can't use it as a computer. Sometimes, I need to compare products but it's not very easy to do it with my mobile... For security problem, I think it is ok because iPhone is much better than android system. I'm not worried »* (Répondant M-5)

Nous constatons aussi en analysant le discours des personnes interrogées que les principaux freins à l'achat en *Drive* tournent autour de la difficulté de juger les produits, l'étroitesse de l'assortiment, ainsi que du montant de la commande qui doit être supérieur à 40 euros. En magasin, les consommateurs peuvent voir, sentir et toucher les produits. De ce fait, le magasin est aussi perçu comme une source d'information sur les produits. Sur le *Drive*, le manque de contact direct avec le produit est considéré comme un frein à l'achat, parce qu'une photo ne fournit pas toutes les informations souhaitables. Cela est plus sensible pour certains produits, comme les produits frais, beaucoup moins pour les produits de marque ou standardisés.

*« Dans le magasin, je peux voir les ingrédients, je peux toucher le produit, je fais attention aux dates, et le produit est en face, mais en Drive on ne peut pas »* (Répondant D-13)

*« Sur le Drive, ça reste une photo, une image, le problème il n'y a pas de 3D. Les photos des produits sont du 2D, donc je trouve que ça peut être un inconvénient ou un frein »* (Répondant, D-1)

*« Le Drive, quant à lui, souffre de la comparaison avec les magasins lorsqu'il s'agit de l'assortiment. C'est clair, il y a moins de choix que le magasin »* (Répondant D-14)

### 12.4.2. Sécurité

Les consommateurs par mobile semblent beaucoup plus sensibles aux questions de sécurité liées à leurs achats *via* leur Smartphone. Cela concerne aussi bien leurs données personnelles et le détournement de leur usage, que l'utilisation de leur appareil comme moyen de paiement et les risques encourus en cas de vol de leur téléphone. Pourtant, cette perception ne les dissuade pas d'en faire usage et ils semblent considérer qu'il s'agit d'une prise de risque qu'il faut savoir assumer.

*« I don't trust mobile commerce because I have to put all my personal information in it, if they use it in other purpose »* (Répondant M-19)

«I could pay with my Smartphone. But I worried about the security problem at the same time, if they steal my phone, I can do nothing then» (Répondant M-1)

«I'm a little bit worried about my privacy in this context, I don't know if my personal information is well secured or not. But everything has risk, like Visa card. We have to pay attention to protect it by ourselves » (Répondant M-2)

### 12.4.3. Accès permanent à l'Internet

La question de l'accès à Internet se pose pour les deux nouvelles façons d'acheter, mais avec beaucoup plus d'acuité pour les achats par mobile : outre la qualité du signal qui varie selon la localisation de l'acheteur, la question du coût d'accès est importante et influence indirectement la décision d'achat car le temps de recherche s'en trouve limité et le consommateur mis sous pression.

«I think it's very important for me if I can connect to Internet or not, sometime there is no connection and I don't know what to do » (Répondant M-11)

«This is a real problem if Wi-Fi is bad and I feel panic when it happens » (Répondant M-13)

«I think it's really important because we all need to use internet every day. I want to search some information with my mobile » (Répondant M-2)

## 13. CONCLUSION

Les deux innovations que nous avons investiguées révèlent deux profils de consommateurs bien distincts des actifs urbains, plutôt aisés et éduqués, vivant en couple et ayant des enfants, forment l'archétype de l'acheteur en *Drive*. Ils sont enthousiastes de ce nouveau mode d'achat car il leur permet de reprendre la maîtrise de leur temps et de leur budget de dépenses courantes. L'offre *Drive* s'inscrit parfaitement dans leur mode de vie, assez stable et organisé, en leur laissant la possibilité de faire leurs achats tranquillement de chez eux ou durant une pause et de les retirer à l'occasion d'un trajet quotidien à peine modifié.

Les acheteurs par mobile sont plus jeunes et moins installés dans la vie. Plus innovants sans doute, ils découvrent et apprécient l'immédiété de l'information obtenue et la rapidité de la concrétisation de l'achat. Déjà utilisateurs convaincus de la téléphonie mobile, ils en découvrent, avec intérêt, les possibilités nouvelles liées à l'accessibilité à Internet qui se généralise. Ils sont séduits par le pouvoir que leur confère ce nouvel outil capable de les renseigner sur les prix de la concurrence, sur les boutiques à proximité, plus généralement sur ce qu'ils ont besoin de savoir, au moment où ils en ont besoin et où ils se trouvent. Le côté ludique de l'achat est bien présent ici, plus que pour les acheteurs de *Drive* sans doute.

Deux profils bien différents, donc, mais qui partagent le fait de tirer leur avantage des possibilités qu'offre l'e-commerce. La multiplication des points de contact, virtuels ou physiques, la mise en comparaison des produits et des prix, l'obtention d'informations préalablement à l'achat, le choix du mode et du point de livraison, tous ces éléments créent de nouveaux comportements d'achat et suscitent de nouvelles attentes. Comme Grewal *et al.* (2013) l'ont suggéré, les magasins traditionnels doivent intégrer ces changements : l'adaptation suppose des investissements lourds dans les technologies de l'information, mais aussi la définition de nouvelles relations avec des clients qui comparent de plus en plus ces différents parcours d'achat et arbitrent en fonction des bénéfices qu'ils peuvent en tirer.

Les résultats des deux approches qualitatives que nous venons de présenter apportent un éclairage intéressant sur des sujets peu ou pas traités jusqu'ici, tout au moins en France. A cette étape exploratoire des deux recherches, certaines variables ont été identifiées qui pa-

raissent influencer le comportement du consommateur. Le contexte de l'achat, le moment où il a lieu, le processus de transaction, la facilité d'usage et celle avec laquelle on peut rattraper une erreur de manipulation, le sentiment de sécurité, facilitent l'accès à ces nouveaux modes d'achat. Le coût pratique, l'honnêteté des prix, la proximité des points de livraison, la maîtrise du temps et du budget, le confort de la commande, la rapidité des procédures et la réduction des efforts physiques demandés jouent en faveur de la fidélité du consommateur aux systèmes de *Drive*. Les acheteurs via *Smartphone* semblent plus sensibles aux opportunités d'affaires, à l'immédiateté du résultat, à l'utilité des apports d'information de toutes sortes, là et quand elles sont utiles. La prochaine étape de la recherche consistera à tester deux modèles quantitatifs qui devraient permettre de hiérarchiser l'importance de chacune des variables et d'étudier leur sensibilité aux situations d'usage.

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# INNOVATIVE REGIONAL DEVELOPMENT BASED ON TRANSDISCIPLINARY APPROACH IN 4.0 INDUSTRY FRAMEWORK IN A LOCAL SERVICE ECOSYSTEM.

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*This paper focuses on a multidisciplinary university of applied sciences as an actor supporting the smart services in its operating territory. The paper introduces a new approach for competence development in a service-oriented Industry 4.0 environment. Also, the renewal and profiling aspects of a higher education institution are covered.*

*A transdisciplinary approach allows for comprehensive and rapid renewal of innovation processes and services. The study creates a concept of how the Industry 4.0 can serve as a comprehensive regional development and education framework. Several case studies on applying transdisciplinary approach on innovative regional development are introduced.*

## 1. Introduction

It is assumed that Europe is at the beginning of a new industrial revolution, considered to be the fourth such a leap forward and hence labeled Industry 4.0. The ubiquitous use of sensors, the expansion of wireless communication and networks, the deployment of increasingly intelligent robots and machines – as well as increased computing power at lower cost and the development of 'big data' analytics – has the potential to transform the way goods are manufactured in Europe. This new, digital industrial revolution holds the promise of increased flexibility in manufacturing, mass customization, increased speed, better quality and improved productivity. However, in order to capture these benefits, enterprises will need to invest in equipment, information and communication technologies (ICTs) and data analysis, as well as the integration of data flows throughout the global value chain. (European Parliament, 2015)

The development of competitiveness of the region maintaining it as an attractive location for companies requires co-operation between actors and building up a roadmap. This roadmap guides how to take continuously and systematically small development steps towards the vision. It is also important to benchmark industrial case studies and field labs on various other regions and find the most successful ones (e.g. Germany, Sweden, Austria).

Digitalization is rapidly increasing and enterprises must find new ways to innovate for business advantage. Through digital transformation, the use of new technologies like cloud, mobile, big data, and social networks with increasing intelligence and automation enterprises can capitalize on new opportunities and optimize existing operations to achieve significant business improvement. The collection of the enormous amount of scattered data, clustering it for analysis, visualizing it for decision making and using the selected data in new service development and execution is most important in the concept of responsible business leadership.

## 2. Research Questions and Research Approach

Digitalization will bring new business opportunities and increasing competition. Companies are forced to renew their processes and activities and at the same time restructure their business models. As well, regions and areas are forced to plan and redesign services in their business environments. In order to see the development needs for attractiveness and welfare, but also to use the development resources in the best possible way the key research questions are:

1. How to prioritize the most important “smarts” in Häme region for Industry 4.0 environment?
2. How is information collected for the use for transdisciplinary development in “Industry 4.0” environment?
3. How is the service seen as a cyber-physical system on a regional basis?
4. How has the service been created in different smart ecosystems?
5. How do we implement Industry 4.0 during co-evolution in a systematic way?

This applied research is based on a qualitative research methodology while utilizing also existing industrial and service research related knowledge. This paper covers several case studies describing on how to apply a transdisciplinary approach based on Industry 4.0 framework to support innovative regional development.

The study is closely linked to Industry 4.0 framework as well as benchmarking relevant and successful regions and universities in Europe. The geographic focus, while developing the concept, is the region of Häme in the southern part of Finland. The various activities within the region are evaluated from the perspective of smartness and their ability to support Industry 4.0 framework as well as the renewal of operations in the region.

## 3. Industry 4.0 as a Framework for Regional Development

The term “Industrie 4.0” was initially originated in Germany (Drath; Horch, 2014). It describes and encapsulates a set of technological changes in manufacturing and sets out priorities of a coherent policy framework with the aim of maintaining the global competitiveness of German industry. It is *conceptual* in that it sets out a way of understanding an observed phenomenon and *institutional* in that it provides the framework for a range of policy initiatives identified and supported by government

and business representatives that drive a research and development program. (European Parliament, 2016)

Industry 4.0 describes the *organization of production processes based on technology and devices autonomously communicating with each other along the value chain*: a model of the 'smart' factory of the future where computer-driven systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions based on self-organization mechanisms. The concept takes account of the increased digitalization of manufacturing industries where physical objects are seamlessly integrated into the information network, allowing for decentralized production and real-time adaptation in the future. (European Parliament, 2016)

The physical world is merging with the virtual world. Industry 4.0 is closely linked to Cyber-Physical Systems (CPS). They can be defined as transformative technologies which manage interconnected systems between its physical assets and computational capabilities. (Lee; Bagheri; Kao, 2014) We are increasingly used to the internet of things, or the internet of everything and increasingly the industrial internet. The widespread adoption of information and communication technology (ICT) is increasingly accelerating and blurring of boundaries between the real physical world and the virtual one. The linkage is becoming increasingly Smart. (Deloitte 2015)

New ICT-related technologies make Industry 4.0 development possible and give opportunities to re-engineer value chains and create new business models. Internet of Things (IoT) is one of the core technologies for Industry 4.0. The growth of connections brings the new possibilities and solutions for business. On the other hand exponential growth brings also new challenges for education, R&D&I and regional development activities. The exponential growth of IoT connections indicates the birth of new business models and new kind of business environments.

This "smartness" requires greater connection and collaborations. This is where the 'explosion' of platforms and ecosystems is occurring. To attempt to connect the inter-nets of things, services, data, and people are needing radical redesigns within industries and the participants to connect all of this up. Presently Industry 4.0 is more industrial driven but this will change and broaden out. (PWC, 2016)

Industry 4.0 and industrial internet can be used to increase the efficiency of processes. Industrial internet enables functional optimization of entire value network and increasing use of material side flows (material and energy efficiency). It is possible to anticipate beforehand the disturbance situation of value network and their repair operations. Collected data from whole the value network can be used for its functional development or forecasting purposes. New entrepreneurship and new digital services can be created through digitalization activities.

In the field of social change, there is little awareness of Industry 4.0 outside the group of key stakeholders. Larger firms tend to be more positively disposed whereas trade unions remain cautious and have reservations. While a skills gap (as well as a gap in willingness) to adjust to the Digital Single Market exists, the skill requirements to adjust to Industry 4.0 are much greater. (European Parliament, 2016)

In Figure 1, there is an example of technology-oriented competence and solution creation on the smart clusters. It is essential to gather data from various sources and



different processes. Automation system or sensor network (IoT) is creating data, which is gathered, clustered, analyzed and compare it with the data gathered earlier and then make decisions on how the optimize activities.

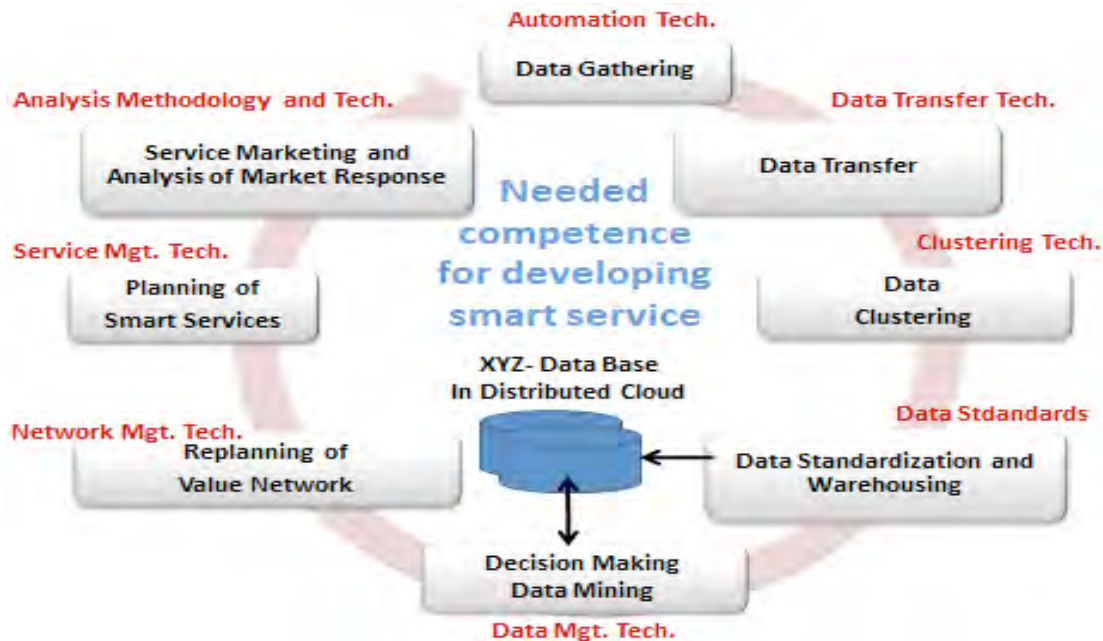


Fig. 1: Relationship of technology and competence using the data effectively

There are several contributing technologies (see Figure 2) related to Industry 4.0 framework. This implies that there is a major emphasis on competence development, and shared learning to apply these technologies to support transdisciplinary regional development.

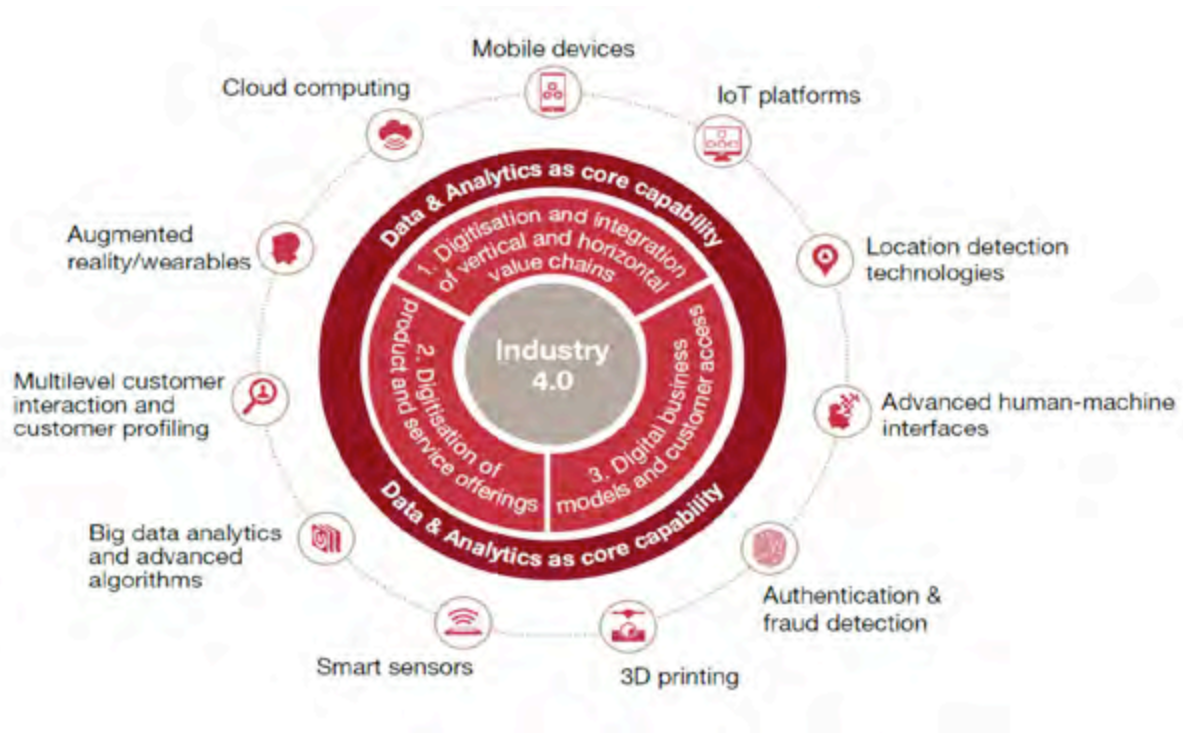


Fig. 2: Industry 4.0 framework and contributing digital technologies (PWC, 2016).

## 4. Benefiting Digitalization and Big Data Supporting Service Business Co-Evolution

The amount of scattered and structured data around us is increasing dramatically. It is a great business opportunity to benefit that data for business purposes. Understanding the value proposition in growing value networks is essential. Management and analysis of data coming from various sources are routed through data- to- service process as described in Figure 3. Creation and optimization of new operational functions and responsible business co-evolution require democratic innovation and decision culture.

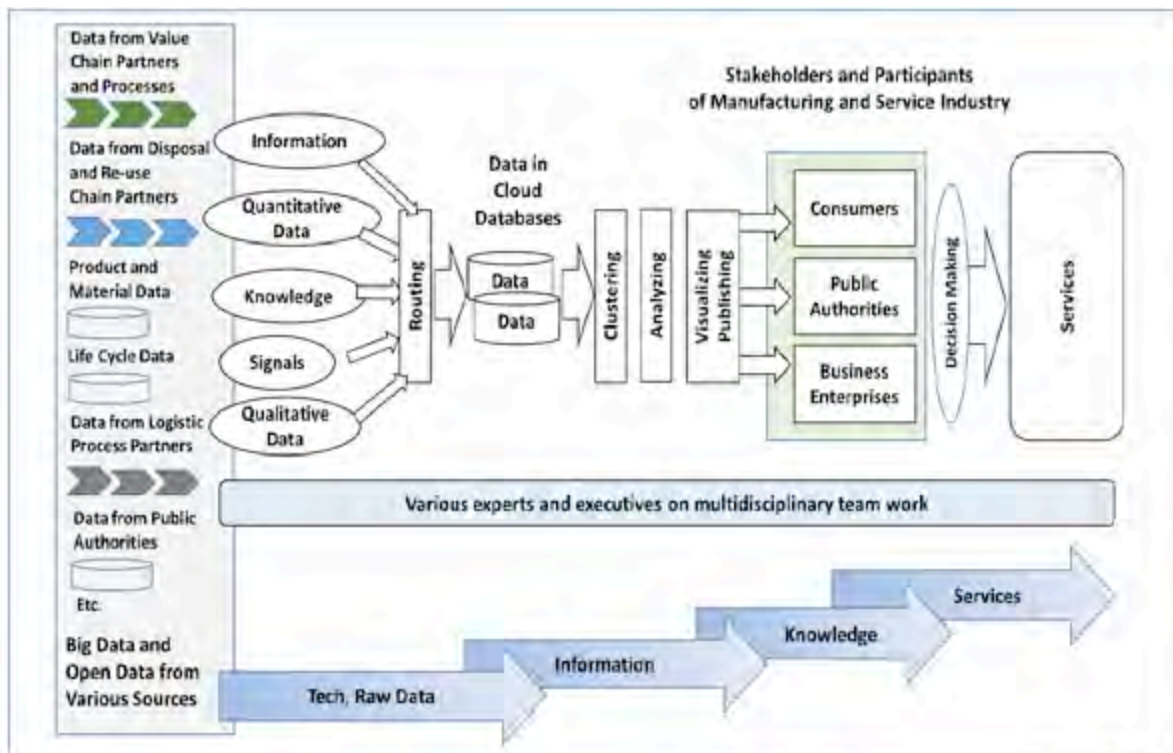


Fig. 3: From data to services process in business co-evolution

Succeeding on 4.0 Industry co-innovation requires data-to-service management process and creation of adaptive multidisciplinary co-operation model for solution development. For research center to be capable of collaborating with industrial companies, it is important to know the overall capability of research and development unit. The experts making applied research with customers have to have content and process knowledge of customer site, they have to be capable of working in teams on distributed way with other experts in value network and have to certain collaborative skills to work together. In our article, we categorize the competence and capability on three layers: content management capability, organizational capability and human competence and capability (Paajanen; Piirto; Kantola; Vanharanta, 2006).

## 5. Multidisciplinary and Co-Operative Service Environment

The co-operation between government, enterprise and universities are essential to succeed in co-evolution when building up cumulative competence in a creation of solutions for regional development by taking advantage of digitalization. Also, it is essential to have a common vision to direct the local operations and funding. Otherwise, the activities can splinter as small pieces and do not form parts of the whole vision.

The development of business environments is understood to be the responsibility of public sector and government. However, the public sector is multilayered (e.g. legislative- national-provincial-regional-municipal- area). Also, there may still be other organizations, whose duty is to develop business environment. All the layers and activities should be along the same line, support each other and be sustainable in order to get the co-operative environment to function efficiently. In a rapidly changing operational environment, a clear and commonly understood vision is required.

The vision and approach are based on the need of regional clusters and the strengths of a region (eg. logistic, university, natural resources etc.). Industry 4.0 development will be seen as a smart utilization of digitalization, which has European level comparability to European development in all key clusters.

Contents of education and training will be designed so that content will respond the future needs. Learning will take place in “real world” environments (field labs), which gives faster cycle time for development activities and implementation. This is the way, how to ensure the birth of new innovations and the renewing the businesses and organizations.

Most regions do not have a strategy or analysis on aligning regional development and digitalization. Häme region is designing its new strategy “Smart Häme” to respond the challenges of digitalization and to be the part of Digital Single Market (DSM). Based on that, the focus is to increase the knowhow to digitalization on Häme region. After a Smart Specialization analysis, five key ecosystems (clusters) were identified. These were expected to be the most critical for the development and attractiveness of Häme region (see Figure 4). These are the ecosystems, which also should have special attention and resource allocation, in development: “Smart Agriculture”, “Smart City”, “Smart Factory”, “Smart Wellbeing”, and “Smart Defence”. The evaluation criteria which were used to select the ecosystems in order to prioritize the development activities and resource allocation were size, knowhow, importance, and versatility of the identified ecosystems.

“Smart Agriculture” was considered to be the strongest and most advanced, because of food processing industry, agribusiness, large education and strong R&D activities in the region “Smart Agriculture” includes both BioEconomy and Circular Economy (bio) activities in the region.

“Smart Health” is the biggest expense in the cost structure of public services. Also, the amount of increasing elderly people and demand for better services emphasize a strong need to utilize the various opportunities of digital services. There are also many equipment and service providers in the region.

”Smart City” was also considered to be one of the key elements to improve the attractiveness of the region. There has been a clear understanding that digitalization will change the planning of cities and the services in a city. The majority of the are probably in the densely populated urban areas in city centres. In Häme region “Smart City” includes also issues related to tourism, “Smart Mobility, Smart Buildings”, and “Smart Security”.

”Smart Factory” has not been traditionally linked with services at all, but when we take a closer look at manufacturing industry we will notice that lifecycle services might even play a bigger role than the production itself. Also, modern supply chains in the manufacturing industry have a strong and large service component. Regional development point of view is important to see that manufacturing itself creates new innovations and services.

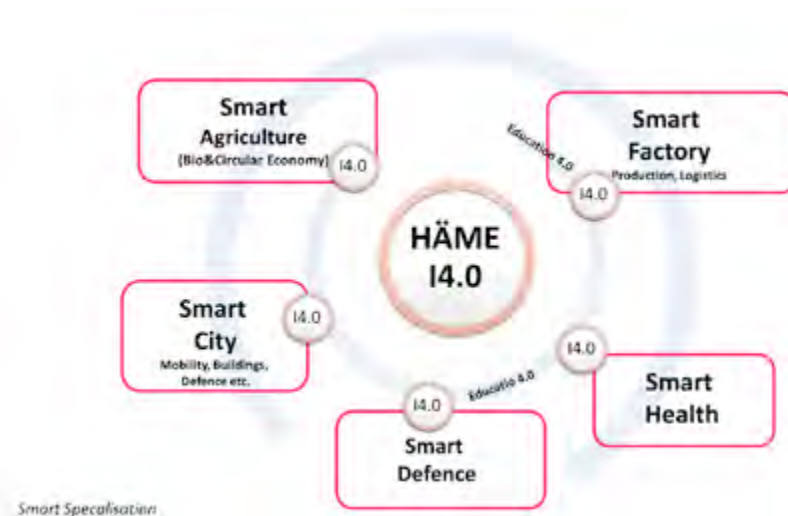


Fig. 4: Häme Region Cluster / "Smarts".

It is also important to understand the supporting nature of knowledge-intensive services in an increasingly digital world. This would better able the regional authorities and developers in co-operation with other actors to support the emergence of innovative ecosystems.

## 6. A Case Study for Applying Industry 4.0 as a Framework for a Local Service Ecosystem

Attractiveness from various perspectives is important so that region would be seen as an interesting and innovative environment. On the other hand cities and public organizations (for example hospitals, military bases, elderly houses, schools, parks, etc. itself are issues, which use tax money for to maintain the welfare and provide service for people and organizations in the region. Based on that background, it would be justified that public organizations would be acting as “platforms” for different

actors. This would allow testing their activities and products in “field labs” where education, research, and testing would take place in the same multidisciplinary environment.

We recommend that Industry 4.0 would be used as a transdisciplinary framework supporting a development of local service ecosystem. Since Industry 4.0 is a European concept and part of European platform, it is wise that best practices will be benchmarked into European approach and experiences.

The key elements to designing the Local Service Ecosystem for Industry 4.0, are:

- **“Smart development areas”** - to recognize the potential “smart” clusters on the region/area
- **Vision** - create the goal and vision for regional development based on “Smart” clusters
- **“Field labs”** - make public sector organizations, cities, companies and universities to work together and create “real life learning” environment (field labs) in clusters.
- **Education** - renew education content so that it response the new ICT-based technologies that are needed in Industry 4.0 and transdisciplinary approach.
- **Benchmarking** - make benchmarking for the regions, which are like “Häme” and have already taken the steps to adapt Industry 4.0 and to ensure compatibility.

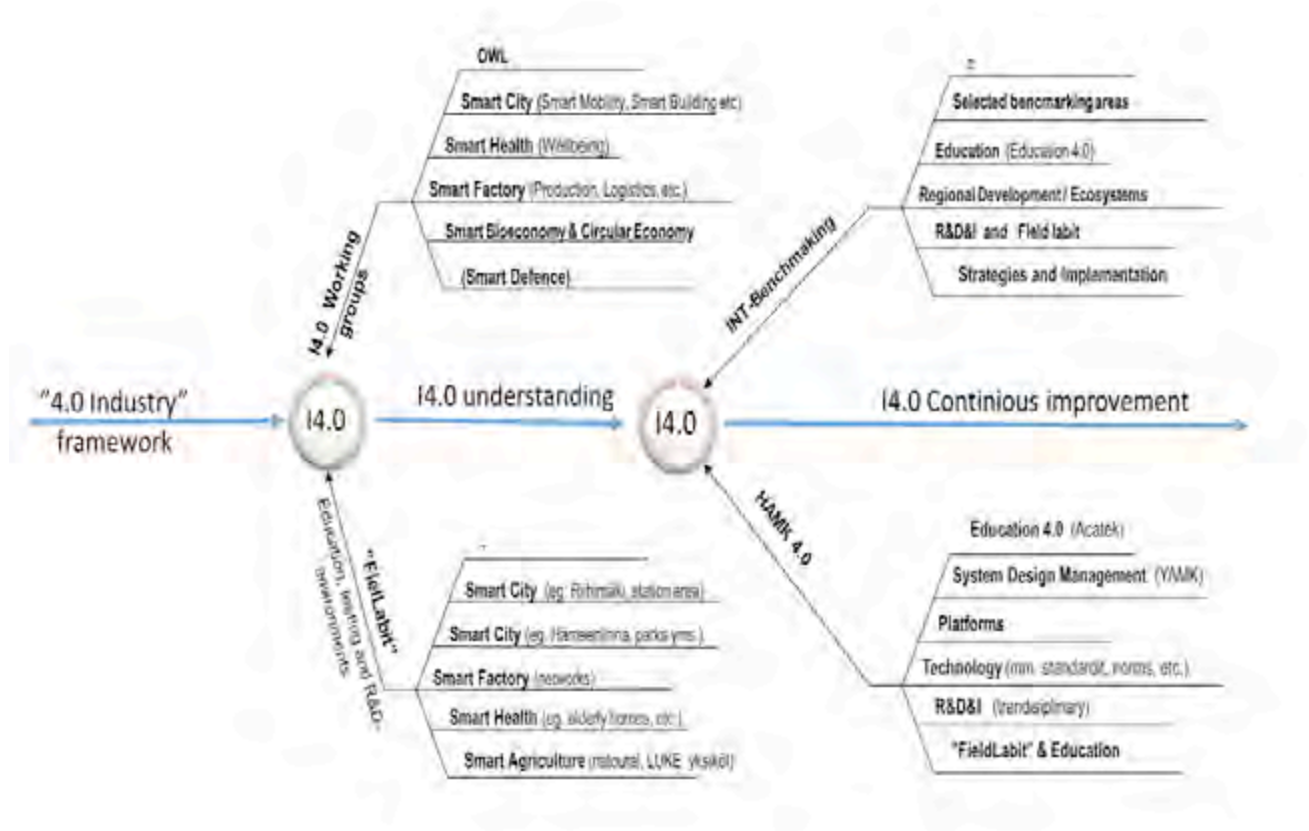


Fig. 5: Steps to develop I4.0 related services

## 7. Riihimäki Station Area Development as a Pilot for Transdisciplinary Research and Development Environment

Rail traffic and its attractiveness are important to the municipality of Riihimäki. Development of user experience is the main priority for the customer. Riihimäki City has researched station area related challenges from the point of view of inhabitants. They are feeling insecure in the area and also accessibility needs development and new solutions. Parking places for bicycles and cars need development. There are a lot of vacant space in the buildings, which also needs new concepts and ideas. There is a need for services in the area and which provide good opportunities for developing a service environment. (Järvenpää; Salminen; Helpiö, 2015)

Riihimäki station area consists of the railway station, old engine houses, business center Liikerata, and parking areas. The station will provide a research and learning environment for smart traffic and flexible logistics. A specific research is required related to trip chains, accessibility, and user experience for digital mobility services (e.g. MaaS). The gathered and analyzed information will be used to develop agile multimodal trip chains and digital services. In order to develop services, open data will be utilized as well as created. The station area will provide a service environment for everyday services too. (Järvenpää; Salminen; Helpiö, 2015)

Ideas for creating the research and learning environment was generated in the workshop with the customer, property owners in the area, research center, teachers, and students. Ideas were organized into four groups: 1) data and digital services, 2) multimodal transport services, 3) new functions, 4) events and activities. (Järvenpää; Salminen; Helpiö, 2015)

Data and digital services include collecting, analyzing and visualizing data as well as utilizing and providing open data. Accessibility can be developed by testing new technologies, feeling of insecurity could be taken care for example by access control services and monitoring. Agile trip chains need management of multimodal transport services. Development activities will be focused for car and bicycle parking, eBike-service for commuter traffic and piloting of mobility services. (Järvenpää; Salminen; Helpiö, 2015)

Education will take place in close cooperation with industry by doing projects by "resolving real life" problems. By this approach, it is possible to educate students to respond to transdisciplinary problems, but also to speed the development of services and region.

Figure 6 describes the case study related transdisciplinary research and development environment. This includes business-oriented research, education, and testing environments in which the innovation of new services and products can be accelerated. Digitalization changes everything and is a great opportunity to find out a competitive advantage in business and services. Universities of applied sciences have a good opportunity and central role in supporting the growth of business in the area of services. Häme University of Applied Sciences (HAMK) has a Smart Services Research Center as a dynamic breeding environment to create and execute, together with co-operation network, well-addressed research and development activities for regional and enterprise development needs. The research unit supports cross-

sectoral utilization of digital technologies and service business development. The objective is also to offer development support for municipal, industrial and commercial organizations by creating new opportunities and responding to business transition challenges. The management of responsibility in value network and the entire society is becoming an important business driver. Most companies, which are moving towards service business, need new concepts to manage life cycle business on the responsible way.

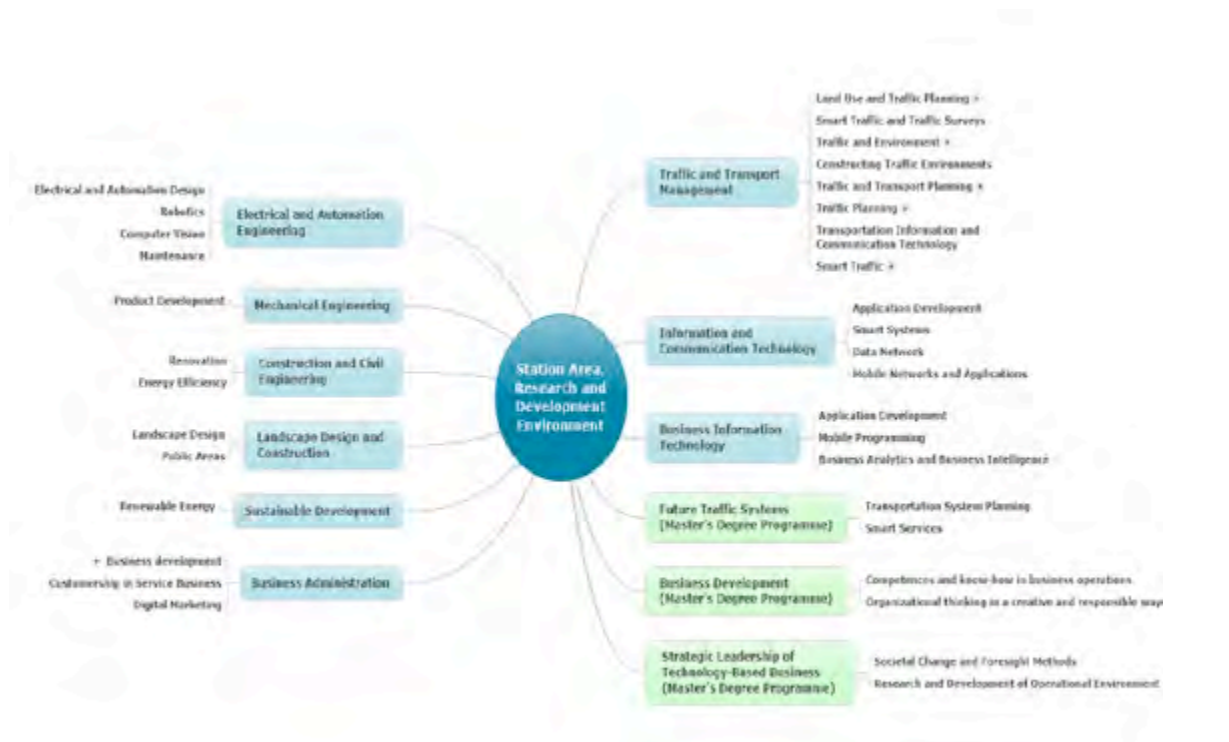


Fig. 6: Station Area at Riihimäki as a “field lab” where different degree programs can do the projects in order to develop the station area according “Education 4.0” (Järvenpää; Salminen; Helpiö, 2015)

## 8. Discussion and Conclusions

The principal idea behind this article has been to combine the principles of Industry 4.0 to value network thinking and digitalization. Industry 4.0 is about creating significant impact and opportunities where business, technology, services, and innovation intersect. The aim has been to find a transdisciplinary concept supporting higher education, regional development and business renewal in testing laboratories supporting and enabling service innovations in the area.

That requires combining of various theories but the main challenge is in the utilization of transdisciplinary knowledge and implementation work. The use of new technologies; digitalization, big data, and social networks with increasing intelligence and automation enterprises can capitalize on new opportunities on and optimize existing operations to achieve significant business improvement on services.

According to the experiences of conceptual development work, successful activity in Industry 4.0 is dependent on systematic long-term development on the public sector. The essential topic is preparing of up to date platforms, which enables and controls and support the operation and creates a business environment to apply new offering.

It is important to give a relevant role for the higher education institutions to provide and support a transdisciplinary approach to study services in a proper operating environment. One of the core roles for universities is to support enterprises by applied research and by creating of research and learning environments for continuous piloting of new technologies and preparation of new business models on Industry 4.0. At the same time, a local higher education institution's future areas of focus, challenges related to digitalization, as well as profiling among other higher education institutions are taken into account.

To be successful on new challenges of Industry 4.0 development, enterprise- university partnership has to be intense and main objective is shared learning. Long-term co-operation creates a background for new co-innovation and business co- evolution. Adapting Industry 4.0 framework as a basis for development activities is expected to provide an opportunity for remarkable competitive advantage for businesses but also to regions. The article demonstrates that Industry 4.0 is not only the goal but also the means.

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# IS SAFETY A VALUE PROPOSITION? THE CASE OF FIRE INSPECTION

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## Abstract

*The aim of the paper is to understand and discuss the schism between alignment of service and the relational service aspect, especially in long-term service relationships. Such understanding and discussion is based on an empirical investigation of the perceptions of fire inspection service within the fire inspection department of The Danish Institute of Fire and Security Technology (DBI) and their customers. Fire inspection is from the supplier side perceived as a knowledge intensive service (KIBS) but is, from a customer perspective, nevertheless positioned and mainly understood as an operational service. This creates challenges in understanding the current value propositions of the fire inspection service as a basis to develop new ones. Theoretically, the research broadly draws on literature related to service typologies, service innovation and value creation..*

## 1. Introduction

At both national and international society levels, there is a general increased focus on security and especially fire security. Fire security, in fact, is crucial for the development of human society, and it has become an important part of human civilization. Fire constitutes a significant type of building disaster that can be a threat to life and property in urban and rural areas. Society has over time responded to the threat of fire in buildings by developing different types of measures, including fire department intervention, insurance, building regulations, education on fire hazards, controls on the use of materials and products in buildings, and the design of buildings to resist the effects of fire (Xin and Huang, 2013). In relation to prevention and detection of fire disasters, the installation of fire prevention equipment in buildings and their proper maintenance have a crucial role, requiring a high competence level and sophisticated technical knowledge from the people performing the inspection.

In Denmark there are two providers of accredited inspections for fire prevention systems, the most important being The Danish Institute of Fire and Security Technology (DBI). The services associated with fire inspection are similar in the two companies, and the two players do not differ significantly from each other.

Since there are only two providers, the Danish market for inspection of fire prevention systems is not characterized by tough competition. However, there are currently a series of trends at national and international level that may significantly change the market. These may include adoption of EU fire prevention regulations in Denmark, which may lower the requirements for inspection or new players focusing on the fire inspection niche market not requiring service provider accreditation.

Given this short background and the lack of literature on inspection of fire prevention systems from a service point of view, the purpose of this paper is to understand the value of the inspection of fire prevention systems as well as the perception of inspection as a service delivery process.

The research question addressed is: "How is the inspection of fire prevention systems perceived as a service both from the service provider and client point of view and what is its perceived value?"

To answer the research question we conduct a qualitative investigation of the phenomenon under consideration among both DBI employees and DBI customers. The results show that fire inspection is from the supplier side perceived as a knowledge intensive service (KIBS) but is from a customer perspective rather understood as an operational service. This creates challenges for the supplier in understanding the current value propositions of the fire inspection service as a basis to develop new ones.

The paper is structured as follows. First we present the theoretical background, then the research method and the case company, subsequently we present the empirical findings and finally we provide some concluding remarks and suggestions for future research.

## 2. The theoretical point of departure

The purpose of the theory section is to position fire inspection as a special form of service, while clarifying where there are research gaps that can be addressed in the future.

Below first we discuss the service concept in general and then the following service types: knowledge intensive services, manual services and professional services. Finally a brief introduction to the service marketing field, and its focus on service as relational is provided.

### 2.1. Understanding Services

The role of services has changed over the last couple of decades or so. A service is no longer a complementary part of core technological products, but service provision has become the very core competence in an increasing number of firms. Therefore services can be characterized in several ways. Here we distinguish in the first place industrial services, which are mainly add on's to products (Oliva and Kallenberg, 2003) and "pure type of services", which here are just called services. Services may be characterized by their knowledge intensiveness, where knowledge may have a role both

as a company resource to develop the service itself or as a service sold to clients as for example in the consulting case. In addition, services are delivered by their immediate producers/service providers to the customers and are not anonymous. This is in contrast to goods, which can be separated from the immediate producers and sold on an anonymous market as for example consumer electronics (Scupola et al., 2009). Services are often delivered and eventually innovated in close relationship with the client. Services often require face-to-face contact between the producers and the consumers in the production/consumption phase, thus services have also often been characterized by the relationship between the customer and the service provider. This, however, is not always the case for all types of services. For example, in the case of repair services, fire security services and fire systems maintenance, the consumption and production of the service is not simultaneous, but consumption takes place after production.

## 2.2. Service Types or typology

Many studies have tried to define the different types of services, and different categories and typologies have been developed (e.g. Miles et al., 1995; Bessant and Rush, 1995; Sundbo (1999)). Therefore, according to the literature it is difficult to come up with just one definition. We present here four main categorizations or conceptualizations of services: Knowledge Intensive Services (KIBS), manual services, professional services and relational services.

## 2.3. Knowledge Intensive Services (KIBS)

Knowledge Intensive Service companies are companies that deliver a 'knowledge offering' as their main service. This usually requires strong interaction between the service provider and the customer. Miles et al. (1995) have characterized KIBS as being companies that: 'rely heavily upon professional knowledge; thus, their employees are usually scientists, engineers, and experts of all types; they either supply products which are primarily sources of information and knowledge to their users, or use their knowledge to produce services which are intermediate inputs to their client's own knowledge-generating and information-processing activities; they usually operate in a business-to-business context (including public services); they facilitate the direct transfer of expert knowledge; carry ideas from one context into another; benchmark, that is they act as intermediary in the process of identifying and focusing on 'good practice'; they act as brokers by putting different sources and users in contact; conduct diagnosis and problem-clarification, thus helping users to articulate their needs in such a way that external resources and opportunities can be effectively used; act as a change agent by providing a neutral outside perspective to facilitate the development of and necessary changes in client organizations.'

## 2.4. Manual services

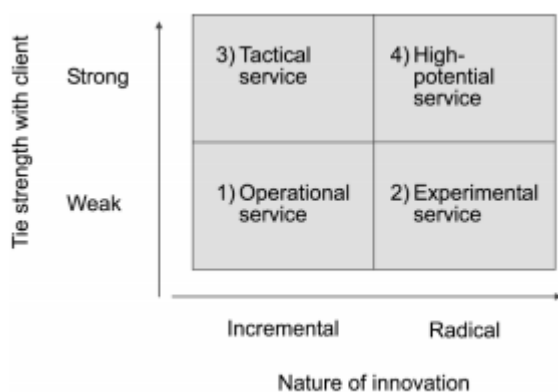
According to Sundbo (1999) manual services are practical or physical activities such as handling things or persons. This type of service may involve knowledge and in some cases, they may even be based on advanced (sometimes technical and scientific) knowledge. However, the output of the service providing activities, (that is the service that the customer gets), is of practical or physical handling nature. Manual services provide solutions to the customers' physical needs and problems. Examples include security, cleaning, transport, repairing, retailing, hair cutting and care services. Manual services have been studied mainly by sector and therefore studies concentrate for example on tourism, transport, elderly care. An important service sector that has been developed over the last couple of decades is the Facility Management Sector.

Facilities management (FM) is the key function in managing facility resources, support services and working environment to fully support the core objectives of the organization ( Chotipanich, 2004; Scupola, 2012 ). Also facility management services are categorized and grouped in different ways. For example, Chotipanich (2004) distinguishes 9 clusters of FM services including real estate and property management, facility project management, maintenance and repairs, building services and operations, office services, planning and programming, space planning and management, operations administrations and management and employee supports and services. Fire inspection could for example fit under the FM services called “Maintenance and repairs” and/or “Building Services and Operations”

### 2.5. Professional Services

By developing a matrix of service innovations, Smedlund (2008) develops a different categorization of services (See Figure 1 below). The horizontal dimension of the matrix represents the nature of the innovation that can range from incremental to radical, while the vertical dimension is defined by the intensity of the relationship between the service provider and the client that can be either weak or strong. The type of relationship between the professional service firm and the client is a significant factor in the classification of the professional services, in addition to the incremental-radical continuum of innovation. Based on these two dimensions, Smedlund (2008) proposes four ideal types of services: operational; experimental; tactical; and high-potential. Smedlund (2008) states that in “an operational service, the professional service firm delivers a service off the shelf and the relationship with the client is weak, in most cases only the order and delivery of a service. Operational services are well known in the market, and both the service provider and the client know exactly what the service includes and what to expect as a result. The service is clearly specified and the delivery follows specified processes and operations. Although the service is more or less fixed and unchanging from client to client, the delivery methods and production processes are constantly improved to gain greater efficiency”.

Usually in this type of service, the profit margin is low since the clients have many different providers they can choose from. According to Smedlund (2008), innovation in operational service should be of incremental nature aiming at improving the existing routines in order to improve the profit margins of the service. Innovation in operational services can be either competence enhancing or consists of incremental improvements in the components of the service (see Hamel, 2000). Usually the risks of failure are very low in operational services innovation. Examples of operational services in the professional service field include auditing, accounting, and banking services.



The second type of service is called experimental service and usually involves high market or technology uncertainty. According to Smedlund (2008)

“The service produced is radically new to the market, but it solves a specific client problem. In an experimental service, the client has a need that has to be fulfilled, but the service provider does not have a ready-made solution for this need. From the clients' perspective, an experimental service is similar to an operational service. For the supplier, however, an experimental service involves considerable risk, since the innovation of a service is radical and involves a high degree of uncertainty.”

Examples of experimental services include web services, such as voice-over-IP services. Innovation is usually radical in experimental services and includes a high level of risk, but also a potential high profit margin. In an experimental service, a professional service firm sells services to its clients before having developed it. Smedlund (2008) suggests that a strategy to reduce the risk inherent in experimental service is to use service or technology modularity in the development of the service required by the client.

The third type of service identified by Smedlund (2008) is called tactical service.

“A tactical service is the cash cow of a professional service firm because of the strong client involvement, combined with the operational characteristics of producing the service. In this service, the client is highly interested in the successful delivery of the service, but the professional service firm has developed competences and operational processes to deliver services on a day-to-day basis.”

Examples of tactical services include law firms, wedding and funeral services. In tactical services, the client is willing to pay extra just to ensure that the service delivery is successful. According to Smedlund (2008) innovation in tactical services can include business model innovations in order to achieve more efficient ways to customize and deliver the existing services for clients. Therefore profits can be increased by creating new ways of serving already existing and committed clients.

The fourth category of professional services is called high-potential services. This service is based on radical innovation and a strong tie relationship between the service provider and the client. In this service, both the client and the service provider are involved in the service innovation process and share the risk and the profit. An example of a high-potential service is the SMS text messaging systems.

## 2.6. Services as relationships

Service marketing, as a special branch within service research, focuses on the relationship between customer and provider. However, since 2000 a significant shift has been made towards a customer-centric focus, where the service relationship, as seen by the customer's eyes, has been the subject of theorizing (Tronvoll et al., 2011). This has contributed to a service understanding that distinguishes between services in plural and service in singular. Services in plural refer to the actual service delivery, while service in singular is understood as the overall process in which special skills are put into play in the context of a customer. This should be seen as a continuous process of resource integration, in which both the customer and the supplier's resources together,

and over time, create value (Vargo & Lusch, 2016). Value as an economic concept has been and is part of the service field's heritage, as business economics has always focused on the value that arises in the exchange of goods / services and money. This is referred to as value-in-exchange (Vargo, 2008). However, recent service marketing literature has developed new and complementary understandings of value creation such as value-in-use and value-in-context.

Value-in-use is a way to emphasize that value for the customer is not necessarily created in the customer meeting but rather occurs in the subsequent use situation (Grönroos, 2011). Value-in-context expands this perspective to encompass the overall context, not only for the „trade-off“ but also for the actual usage situation. In this sense, factors such as culture, institutional frameworks, social relations and subjective dimensions are reflected in the actual perceived value (Sandström et al., 2008, Vargo & Lusch, 2016).

Basically, there is a shift from a focus on value in the company's sphere to value in the customer's sphere. In addition there is an overall understanding that a company cannot, as such, deliver value, it can offer only value-proposition (s) (Grönroos, 2016), and that a pre-requisite for creating value is a trust-based service relationship (Greer et al., 2016) and in-depth knowledge of the customer's perspective (Heinonen et al., 2013).

## 2.7. Summary

In summary, service research focuses on categorizing service and understanding where and how value creation takes place. The field is both characterized by macro studies that focus primarily on sectors, and on micro-studies that take an organizational perspective. It is especially at the micro-level that there is a knowledge gap as to understand operational services and their value. On the other hand, FM research has focus on operational services, but being this field based on an engineering tradition has mostly a systemic focus to added value (Jensen et al., 2013), where value perception is related to what added value FM generates strategically and not on the relational / interaction level as in service studies. In that sense, one can argue that there is a lack of studies that bridge the FM field and the service research field.

In this study of fire inspection, the understanding that value is not created by the service provider, but that it occurs in the customer's sphere helps to shed light on the customers' understanding of fire inspections and the context in which the inspection is given.

## 3. Research Method

A case study was conducted to understand how brand inspection at the Danish Fire and Security Institute (DBI) is perceived from both an employee and a customer perspective. A case study is considered an appropriate research method to investigate real-life contexts, such as the perception of brand inspection. A case study is relevant when the study, as in this case, is driven by how and why questions, and there are no systematically collected and documented knowledge in the field. In addition, this case can be characterized as a critical case (Flyvbjerg, 2006). A critical case is one where that the knowledge gathered may be transferred to other similar cases because the

case itself is of strategic importance - either by representing the least likely or most likely case in the area (Flyvbjerg, 2006). The case of DBI's fire inspection is critical because being DBI the largest and oldest player in the brand inspection market makes it likely that the challenges met by DBI may also apply to other similar players.

### 3.1. Data Collection

The research and development director contacted the team of researchers because he was interested in better understanding fire inspection as a service and its value both for DBI and its customers. After two introductory meetings, he set up a meeting with the director of the Fire Inspection department. The project was started. We agreed that first we interviewed respondents at DBI and then in selected customer companies. The director of the Fire Inspection department provided access to conduct the field-work both in the company and in the customer companies, giving us legitimacy and credibility with the interviewees. In the initial phase of the project, a preliminary study was conducted, focusing on DBI employees' understanding of the fire inspection service. In order to get as nuanced a picture as possible, two strategic level employees, a tactical level employee and two employees at the operational level were interviewed. The interviews lasted an hour and were held at the employees' workplace or by telephone. In addition to providing insight into DBI's fire inspection service, the interviews were the basis for defining recruitment criteria for interviewing the customers. In the second phase, the focus was on DBI customers' perceptions of fire inspection service and its value. Ten interviews were conducted with ten different customers. Four interviews were conducted face-to-face at the customer's office, while the remaining six were conducted by the telephone. All interviews lasted between one and one and half hours each. The interview themes included perception of fire inspection, value of fire inspection, the fire inspection process and the role of the fire inspector. The interview guide was reviewed by the two directors in charge of the project at DBI and additional input was integrated before the first and second interview round. All of the interviews were assigned a number. Due to the respondents' wish for anonymity, in the analysis we only refer to their job title and the interview number. Based on the first round of interviews at DBI, we agreed that recruitment criteria for interview participants from customer companies was company size, geographic location, public / private organization, and service contract duration.

Table 1: Reliability and validity of the data		
Reliability Through		Validity Through
1. Case study protocol. Informant profiles and contact information. Representative list of interview questions. List of other potential themes to be explored in the interview.	2. Case study database. Recorded audiotapes. Interview transcripts of each unit. Transcripts of e-mail and notes about telephonic and face-to-face meetings with informants.	1. Multiple sources of evidence: Interview transcripts; telephone and e-mail discussions; information available on the web sites of the company and customers, documents provided by the company. 2. Establishing chain of evidence: In the case description, we have cited extensively from the contents of the case



The questions were reviewed by the case company and amendments were made to the questionnaire afterwards	Company documents relating to the fire inspection, websites.	study database. The data collection closely followed the case study protocol (Kirsch 2004). Thus, the chain of evidence presented helps link the empirical material with the findings. 3. Review of article: The initial draft of the paper case was reviewed by the company.
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The interviewees included key relevant employees, project managers and directors dealing with fire inspection at DBI and at relevant customers. (See Table 2 for details about the interviews). Moreover, an ongoing dialogue with the case company has taken place in order to identify any misunderstandings, discuss relevant issues and obtain additional insights both by telephone and by e-mail. The complementary data collection method was documentation review. Sources included corporate websites of DBI and the customers, company brochures, annual reports, trade and specialised press articles.

Type of data	Data material
In-depth interviews (duration approx. 1 hour each)	5 interviews with employees at DBI 1 group interview with 3 employees at customer company 9 interviews with customers
Participant observations	2 meetings with Director of R&D 1 meeting with Director of Fire Inspection Department 1 meeting with Directors of R&D and Fire Inspection Department 1 meeting with top management at DBI
Documents	Internal reports provided (DBI) Brochures about fire inspections and fire inspection department Organisational charts Company websites of DBI and customer companies

Type of organization	Role of interviewee
DBI	Head of R&D
DBI	Director of Fire Inspection Department
DBI	Head of Fire Inspection Department
DBI	Inspector
DBI	Inspector
Large company, retail	Head of operations, decision-making authority in regard to procurement

Large company, university	Project manager, decision-making authority in regard to procurement
Large company, airport	Head of operations, decision-making authority in regard to procurement
Large company, toys	Head of operations
Large company, windpower	Head of operations
Large company, windpower	Procurement manager, Installation contractor
SME, manufacturer	Installation contractor
SME, hospitality	Head of operations, decision-making authority in regard to procurement
SME, retail	Head of operations
Municipality	Procurement manager

### 3.2. Interpretivist Perspective and Data Analysis

Given the limited body of knowledge about fire inspection as a service and the type of our research question (i.e. How Question) (Yin, 1997), we rely on the interpretive case study method (Walsham, 1995) to investigate how DBI and its customers perceive the service of fire inspection and its value. Therefore, the point of departure, both in terms of understanding the phenomenon and knowledge production is that the researcher necessarily is a part of and influences what is being investigated (Presskorn-Thygesen, 2012). By adopting a social constructivist perspective, the focus is on understanding how fire inspection is experienced and elucidated from different perspectives as well as how meaning is being constructed between actors. This also relates to the relationship between the acquired knowledge and the broader context in which this knowledge is created (Justesen & Mik-Meyer, 2011). The data analysis follows Miles and Huberman (1994) instructions for analysing qualitative data and interviews using categories and themes. In the process of data collection, data coding (Miles & Huberman, 1994) and constant comparative analysis (Corbin & Strauss, 2008), a number of themes emerged from the data that helped organize the analysis

### 3.3. The empirical context and the case company

The empirical domain of the paper is fire inspection in Denmark, with particular focus on DBI. Historically, the brand inspection market has been characterized by monopoly, with DBI up to 2005 being the sole supplier of accredited fire inspections in Denmark. Fire inspection is a highly specialized field, and most of the Danish specialists are employed in DBI. In 2004, feature-based fire requirements were introduced, which means that no real legislation is specific to fire alarm systems. However, in the Building Act there is a distinction between categories of applications, where in some cases there is a requirement for automatized fire alarm systems (ABA). The categories of applications relate, inter alia, to types of people in the building, and to what extent they are self-reliant. Overall, it is the fire authorities and insurance companies that set the limits and requirements for fire inspection. These requirements are based on DBI's own guidelines and on the guidelines developed in the standing (or Standard??) committees for which DBI acts as secretariat and publisher. The legal aspect in relation to fire inspection is that a control plan must be prepared (for the builder), but that it is the advisers who define the degree of control – for example, whether it should be conducted by any accredited institution or not. Therefore, there is increased pressure from a number of interest groups such as unions and other fire inspection institutions and companies to liberalize the market. Forthcoming European Union directives may increase internatio-

nal competition on the Danish market as well.

Despite the changing conditions for fire inspection market, DBI does not do anything actively to make customers aware that DBI is not an authority in the market and that the market is characterized by de facto 9 rules. This is seen as both an advantage and a disadvantage - it is possible that many customers do not question DBI as a supplier, but at the same time it does not ensure transparency for the customer. This might be because the inspection department is DBI's economic strength, as it accounts for one third of the company's total earnings. The fact that earnings generate economic space for actions outside the department means that there is great strategic awareness about the inspection department.

### 3.4. Type of Services and Customer profiles

There are two types of fire inspection services: first-time inspection and subsequent annual inspections. In relation to this there are two customer categories: new customers who need a fire inspection permit for a new building or a restructured building and customers who want a framework agreement for annual fire inspection - either on a limited time basis or unlimited. The first-time inspection is therefore important as it provides the basis for the customer's choice of DBI for subsequent annual inspections. A large part of DBI's customers is regular customers.

At the first time inspection it is the company installing the fire alarm system that chooses the inspection company/institution, while for subsequent annual inspections it is the company / organization in which the inspection is carried out that chooses the inspection company/institution. The person responsible for the fire alarm system after the initial inspection may be the purchasing/procurement manager, the technical officer or the „man in the blue suit“. Seen with DBI's eyes, it is most difficult to negotiate contracts with the purchasing/procurement managers because they mainly focus on costs, whereas the technical manager is more likely to act as an ambassador for fire safety and therefore has a different starting point for contract negotiations.

DBI's regular customers have different characteristics based on company size and the fire inspection requirements that may be related to the number of buildings and types of users. Most inspections last approximately one hour, but in the large companies where the buildings are distributed on a larger geographical area, the inspection may last several days or weeks.

Another aspect in relation to customer profiles is the attitude to and interest in fire inspection. One type of customers is interested in fire systems and the technical specifications and are interesting in negotiating the price. They are primarily employed in large organizations where especially compliance and the company's own complexity becomes a challenge. Another type of customers wants a discount product. DBI calls it a „stamp product“ because the customer rarely challenges the price, but basically just looks forward to get the inspection done. These different characteristics also relate to explicit attitudes concerning fire safety in the customer organizations.

## 4. Empirical findings

The main themes identified in the data in relation to fire inspection as a service and its value are perceptions of fire inspection, the value of fire inspection and the inspection services.

Overall, there is no significant divergence in employee views on inspection as service, value creation or the business itself. The diversity, among the employees, became rather clear in terms of customer understanding and competitive perceptions. In the customer interviews, the crucial difference in the feedback was whether the customer had a thorough knowledge of fire safety or not. In the following, knowledge is reported from all 15 interviews. Otherwise, if it was at project manager level or at operational level (e.g. electrician, etc.)

#### 1. How is Fire Inspection perceived?

##### **Inspection as control**

Both DBI employees and customers associate the term inspection to control and legislation. The common understanding is that inspection means to check if procedures and / or technical facilities work as intended, both on the day of the inspection and the time in between inspections. Inspection is also understood as a guarantee that the customer's fire equipment works well in case of need. Therefore, especially the large companies have chosen that all fire installations, including also those for which it is not a requirement have to be inspected. For most customers, it is not clear who is in charge of legislation and guidelines in this area. So even though there is a common understanding that it is the fire authority that sets the specific requirements, there is generally no understanding of what the legislation is in the field at present or what it might be in the future.

##### **Inspection as service**

DBI management perceives fire inspection as an area of expertise characterized by quality and specialist competencies rather than a control check. From the customer's point of view, this is described as quality assurance - both in relation to the fire equipment installation, the maintenance, and in relation to subcontractor's work. And then the emphasis is placed by the customers on the dialogue with the fire inspector as an illustration of the service surrounding the control aspect. However, it is primarily the operators within the customer companies who are competent and trained in fire safety and understanding, which recognize the level of competence of DBI's fire inspectors. Those customers who do not need a long-term inspection are not necessarily acquainted with the specialist knowledge that an inspection requires. For them the service aspect of fire inspection relates to the dialogue and the experience of being heard before and after the inspection itself.

##### **Schism between advice and impartiality**

At the strategic level in DBI, there is focus on the business potential of selling more consulting in relation to fire inspection. At the operational level, the focus is rather on staying within the framework of accreditation, but at the same time being the organization "guiding" the customers in the right direction - both in terms of handling the system, but also in relation to who actually has responsibility if an accident occurs and the system is not working properly. In DBI's optics, the difference between "guidance" and consulting is that guidance is referring to a standard/requirement described in a book while consulting implies to come up with solutions to concrete customers' problems. However, there is a shared perception that the boundary between the two is blurred and is not completely sharpened. The majority of employees regard impartiality as something positive and as a competitive parameter. Impartiality is also considered important by the customers as they perceive DBI as an

authority. Even though this is not the case, it is still a common sense or a role that the customer feels the inspectors take on. The respondents in the customer companies have different focus on the balance between impartiality and consulting. For the customers, impartiality is not linked to accreditation, but is understood as a second opinion that supports qualified risk management. Several respondents therefore state that if there was no requirement for accreditation, they would probably still have fire inspections, but under other conditions - and perhaps they would themselves be responsible for quality control of the fire systems as they experience the fire inspection as expensive. Although some customers receive insurance rebates, only a few believe that the accredited inspection statements on the fire system play a role in insurance policies.

## 2. Perception of fire inspection value

### Troubleshooting as value

The primary value of the inspection from both DBI and customers' perspective is that defects are detected on the inspected fire facilities as errors can be found in up to 60% of the fire plant inspections. DBI's employee perceptions in relation to how the customer experiences the value of inspection, is that the value is that they receive evidence that they comply with the guidelines, standards and requirements in the area. Another aspect of the troubleshooting and the related inspection report is that it is used as a legitimate tool for internally pushing colleagues or subcontractors to prioritize the inspection remarks concerning the fire alarm systems that need to be addressed. However, as a manager comment: „Do not forget that at the end of a remark there is a cost!“

### Safety as value

Another aspect of value creation is safety. Safety is for some companies related to both people / employees and the business itself (materials and production equipment). For the municipalities, safety relates to the building itself, while for companies working with flammable materials, safety also relates to ensuring the local area. For the system operators it is also a matter of responsibility. They feel in fact responsible for the buildings and employees not suffering any harm. As more than one informant states: „I must be able to sleep safely at night“. This makes fire safety a personal matter for the system operators. Instead, the purchasing and procurement managers are more interested in the economic security and legitimacy in relation to the organization. Furthermore, several customer respondents state that they need their fire alarms to be connected with the emergency centers. As such, the accredited inspection is valuable because it provides access to a security service provided by the emergency authorities.

## 3. Fire inspection as a service

Understanding of service and service quality in relation to fire inspection For inspectors, a good service is when their professionalism comes into play in the actual customer encounter. This means that the inspection at companies / customers who only wish a quick inspection is not perceived as definitely satisfactory service. That is, even though a customer may think that an inspection where they do not have so much contact with the fire inspector is a good inspection, DBI employees believe it is important to have contact with the customer. A poor service experience for the inspectors is to visit those customers who see the inspection only as a control or a raised finger. This is in contrast to the customer perception of a bad inspection as a service. The bad inspection is for the customer one in which alarms are triggered, one that influences daily operations or if the inspector interprets the rules in a too strict way and does not engage into a dialogue with the customer.

For the customer, a good inspection is both one where there are not many remarks, because fewer resources are needed to fix the problems and one where problems are indeed detected so they feel that they can fix them and be on the safe side if any accident should occur. In addition, personal chemistry is often mentioned as a determinant factor for good inspection. Especially with long-term inspections, it is important that there is good “chemistry” and respect between the inspector and the customer.

### The relational aspect

In the fire inspection business, there are several relationships at stake. There is the relationship between the customer department in DBI and the purchasing/procurement department in customer companies or organizations. In addition, there is the relationship between the fire inspectors and the actual end customer and/or the end customer's subcontractor.

The fire inspectors state that the relationship becomes important in the meeting with the end customer although there is a wear in between the fire inspections. Such relationship is often characterized by trust. This is confirmed by the customers. The inspectors are seen as “fire safety sparring partners”, and especially for the large organizations, it is positive that it is the same inspector allocated to the task year after year. In this way, the inspector builds knowledge of both the company and the buildings that contributes to make the inspection smoother. However, this has the implicit risk that the inspectors might oversee some changes in the alarm system conditions, making the fire inspection less reliable. Another crucial element in the relationship between the customer and the inspector is that the more and better dialogue takes place between the inspectors and the customers, the more contextual knowledge the inspector can get and the better inspection service can be provided. Understanding the fire alarm system in its concrete context, both in relation to the building and in relation to daily employee practice in a given company, in fact may, increase the ability to understand what is the best for the fire alarm system to remain operational.

### Decision making process

In some cases, the operator is also the decision maker in relation to the choice of the fire inspection provider. In other cases, the operator gives input to the purchasing department, while in some organizations there is no correlation between those responsible for fire protection at operational level and the procurement department. For some customers, it is almost given that DBI is “THE” supplier of fire inspection. This can be based on a long history either with DBI or with the inspector itself - even though some respondents believe, it is important to switch subcontractor sometimes. Most customers renegotiate their contracts every few years

## 4. Discussion

Fire inspection is an illustration of a special type of service that is knowledge-intensive and specialized, but delivered in an operational service context. This means that fire inspections today are primarily perceived as a quality control of fire alarm systems, and not as crucial to the core business of the organization.

In addition, some customers see fire inspection as a tactical service, whereas others see inspection as an operational service. That is, even though the service provided can be characterized as knowledge intensive according to the service provider, it is delivered in a manual or operational context. Brand inspection is thus, as service offering, caught between two service understandings; Knowledge Intensive Business Services

(KIBS) and operational service. In addition, DBI refers to inspection as a service, but customers primarily perceive fire inspection as control as it is a service that they cannot avoid in many cases. DBI and some customers distinguish between the actual inspection - a check that everything is as it should be - and the knowledge transfer that can take place between the inspector and the customer. Knowledge transfer and learning, which in itself can increase fire safety, and that can be understood as a service. This discrepancy in understanding can create a discrepancy in the expectation of what brand inspection is and can.

There is a meta-narrative about fire inspections, as set by legislation. However, in reality requirements for fire inspections are rather based on guidelines and requirements from municipal fire authorities, and not by national laws. Despite the revised conditions for fire inspections, DBI does not do anything actively to make customers (those who do not have knowledge about building regulations) aware that DBI is not an authority and that the area is characterized by de facto rules.

Different perceptions of the value of fire inspections exist between DBI and their customers. Thus, in order for DBI to develop future value propositions, it is crucial to understand the customer's perception of what is actually purchased during an inspection: control, sparring, an approval or some form of security. Furthermore, the value of fire inspection can be created both in the meeting with the customer and in the customer's sphere. In cases where the inspector and the operator inspect together, there is a natural platform for value creation. In cases where the inspection takes place without the customer operator, the value is created when the inspection is over and eventual remarks are corrected.

There may be a potential for DBI to increase its focus on facilitating value creation before, during and after the inspection, and by gaining an understanding that value may be linked to different functions and levels in the customer organization: the strategic, the tactical and the operational. This means that it is not only the inspectors who may create platforms for value creation, but also sales department, IT department and DBI management.

Another aspect in relation to value creation is that DBI's employees perceive an "invisible" inspection, where they do not have contact with the customer as a bad inspection. But for those customers who just want the inspection carried out without interaction, there may potentially be value in such an „invisible“ inspection.

## 5. Conclusions and recommendations

Fire inspection is an illustration of one special type of service, that is knowledge-intensive, but delivered in an operational service context. The inspection service is therefore today primarily perceived as quality control of FM-services, and not as crucial to the actual core business of the client organization. The study identified a divergence in customer perceptions of the fire inspection service. Some customers look at fire inspection as a tactical service, whereas others see inspection as an operational service. That is, even though the service provided can be characterized as knowledge intensive, it is mainly perceived as a manual, operational service. Fire inspection is therefore stuck between two service understandings; Knowledge Intensive Business Services (the KIB'S) and operational services

DBI refers to inspection as a service, but the customers first and foremost articulate fire inspection as control. DBI and some of the customers, makes a distinction between the actual inspection as a control, and the knowledge transfer which can take place

in between the Inspector and the customer. A knowledge transfer and learning, which in itself can provide increased security, why understood as a service. This possible anomaly in understandings can create a mismatch in the expectations of what the fire inspection is and can be.

Future research can contribute to improve understanding of the inspection as service delivery and relative implications for the relationship between customer and service provider.

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## KIBS REGIONAL SPECIALISATION PATTERS: A COMPARISON BETWEEN THREE EUROPEAN REGIONS

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*Due to the renewed interest showed by researchers in regional specialization and KIBS issues, the main aim of this paper is to provide a detailed analysis of and comparison between the specialization patterns followed by KIBS firms located in three peculiar European regions (Basque Country, Piemonte, and Friuli Venezia Giulia). In order to achieve this aim, both absolute and relative specialization indices have been computed. Results mainly show that it is not possible to identify a single “specialization patter” between regions and that it varies also depending on the data used. The paper provides both theoretical and practical implications related to regional specialization patterns and KIBS firms.*

### 1. Introduction

Recent years have been characterized by a renewed interest in concentration and specialization patterns, in order to understand if, how, and why the removal of barriers to trade and to factors mobility generates a greater concentration of economic activities and a greater specialization of regions (Geppert et al., 2008; Herruzo et al., 2008; Krugman, 1991a). It is worth noting that these researches have been conducted almost exclusively for studying the concentration and specialization patterns of manufacturing industries (e.g., Alonso-Villar and Del Río, 2013; Amiti, 1999; Bertinelli et al., 2009; Brülhart, 2001; Brülhart and Traeger, 2005; Geppert et al., 2008; Herruzo et al., 2008; Krugman, 1991b; Maurel and Sédillot, 1999; Paluzie et al., 2001; Suedekum, 2006).

In fact, despite the service sector represents 70% of European output as well as one of the main pillars of the global economy, due to its persistent growth during the last years and compared to the industrial sector, similar services-oriented research remains rare.

Moreover, due to the relevant role played by the knowledge factor, some services (such as: consultancy, labour recruitment, computer related services, etc.) – the so-called Knowledge-Intensive Business Services (KIBS) – “are likely to be one of the main engines for future growth within the European Union” (European Commission, 2007, p. 7). In particular, KIBS are becoming increasingly important for stimulating and developing the economy of a territory, due to their tendency to localize in metropolitan and well-developed regions (González-López, 2009), resulting in major territorial imbalances in their distribution.

This tendency has generated a renewed interest among researchers, even though according to Corrocher and Cusmano (2014), the research about the relationship between KIBS and the competitiveness and evolution of Regional Innovation Systems (RIS) is still at an early stage and more in-depth analysis is required to understand the link between the competitive transformation of regions and the role played by KIBS rooted in these regions.

All of the foregoing, the main aim of this paper is to partly fill this gap by providing a detailed analysis of and comparison between the specialization patterns followed by KIBS firms located in three peculiar European regions, through the use of and comparison between specialization indices.

In order to achieve this aim, three different objectives have been identified:

1. To verify if the specialization in KIBS of the three analysed regions is higher than the one of their own countries.
2. To identify what are the KIBS activities that contribute most to the KIBS specialization degree of the three regions.
3. To verify if the regions' KIBS specialization pattern varies depending on the “level” of Specialization index used for the comparison (i.e., national data and EU28 data, respectively).

According to these objectives, specific hypotheses have been formulated and verified throughout the study.

After this introduction, the paper is structured as follow. The next section is devoted to the analysis of existing literature on regional specialization and KIBS. In the third section, the investigated sample, data, and methods used in the paper are described. The fourth section reports the analysis and discussion of the obtained results. Finally, the last section is devoted to the concluding remarks, the main study limitations and the possible future research lines on the theme.

## **2. Theoretical Framework**

### **2.1. Regional specialization of industries: definition and measurement**

Last years have been characterised by a renewed interest among researchers in respect of concentration and specializations patterns. In particular, from a statistical viewpoint, the literature concerned with these two topics used to treat them as two

sides of the same coin: considering a matrix with the columns referring to countries (or regions) and the rows to industries, specialization can be analysed seeing the columns, whilst concentration by interpreting each row (Aiginger and Rossi-Hansberg 2006; Goschin et al., 2015).

However, there are some empirical outcomes that suggest considering these two processes as independent. In fact, according to Dalum et al. (1998) and Aiginger and Davies (2004), specialization and concentration do not always move in the same direction, and they may even go in opposite directions (Aiginger and Rossi-Hansberg, 2006), and in agreement with this strand of literature, this paper focuses exclusively on regional specialization.

As stated by Goschin et al. (2015, pp. 256-257) “Regional specialization expresses the regional perspective and depicts the distribution of the sectorial shares in its overall economy, usually compared to the rest of the country. A region is considered to be highly specialized if a small number of industries have a large combined share in the economy of that region”.

The specialization of a certain region in particular industries may arise as regions exploit their comparative advantage, take advantage of economies of scale in production, or both (Kim, 1995; Paluzie et al., 2001; Storper et al., 2002) and it is believed to be conducive to intensive knowledge flows between the firms that share the same technological base (Beaudry and Breschi, 2003; Fritsch and Slavtchev, 2010; Mowery et al., 1998).

In 1996, Krugman and Venables set up a specific model to explain industrial specialization considering two industrial sectors. The main prediction of this model is an increase in regional inequalities, which determine important policy implications, especially for the European Union (Paluzie et al., 2001).

In this respect, there is a broad discussion in the literature regarding the different ways in which it is possible to measure the regional specialization (Combes and Overman, 2004; Ezcurra et al., 2006; Palan, 2010), and stemming from that, the empirical studies carried out in this field used to apply different kinds of indices. In general, the regional specialization indices measure the degree of industrial specialization (or diversification, on the contrary) of a region, indicating if the production of that region is concentrated (or not) in fewer branches than the country average in which the region is situated (Hallet, 2002; Paluzie et al., 2001). Moreover, it is important to note that, despite the index used, in order to carry out an appropriate measurement of the regional specialization, researchers must distinguish between absolute and relative specialization indices (Palan, 2010). In particular, through the use of absolute specialization indices, it is possible to state that a region is specialized if a small number of industries/branches exhibit a high shares of the overall employment of the region (Aiginger and Davies, 2004); whilst, the relative specialization indices provide a comparison between the region’s industry structure and the average industry structure of the reference group of countries/regions, revealing its comparative advantage in relation to the reference group. This entails that, if a region is specialized in industries in which also other regions are specialized, the absolute indices will show a high specialization degree, whilst – on the contrary – the relative indices will indicate a low specialization degree. Thus, the distinction between absolute and relative indices is fundamental for a correct analysis of the specialization degree of a region. Following

this reasoning, this paper adopts both absolute and relative specialization indices as proposed by Merino and Rubalcaba (2012).

## 2.2. Knowledge-Intensive Business Service Firms

The term Knowledge-Intensive Business Service (KIBS) was introduced for the first time by Miles et al. in 1995 to indicate “economic activities which are intended to result in the creation, accumulation or dissemination of knowledge” (p. 18). However, in 2000, Hertog has provided a more detailed description of KIBS firms, defining them as “private companies or organisations who rely heavily on professional knowledge, i.e., knowledge or expertise related to a specific (technical) discipline or (technical) functional domain to supply intermediate products and services that are knowledge based” (p. 505).

Nowadays, KIBS firms are portrayed as *bridges of innovation* (Bessant and Rush, 1995; Chun-Yao et al., 2011; Colombo et al., 2011; Corrocher and Cusmano, 2014; Czarnitki and Spielkamp, 2003; Muller and Zenker, 2001; Strambach, 1998, 2001; Thomi and Böhn, 2003; Yam et al., 2011), playing a key strategic function for turning technology into competitive performance and performing three main functions (Hauknes, 1998; Hertog, 2000; Mas-Verdú et al., 2011; Wong and He, 2005):

1. *Facilitator* of innovation: KIBS firm supports a client firm in its innovation process, but the innovation at hand does not originate from the KIBS firm;
2. *Carrier* of innovation: KIBS firm plays a role in transferring existing innovations from one firm (or industry) to the client firm (or industry), but the innovation at hand does not originate from the KIBS firm; and,
3. *Source* of innovation: KIBS firm plays a major role in initiating and developing innovations in the client firm; thus, the innovation at hand originates directly from the KIBS firm.

The strategic role of KIBS is increasingly perceived as crucial for the competitive performance of Regional Innovation Systems (RIS), and follows a double path (Corrocher and Cusmano, 2014): on the one hand, KIBS represent a constitutive component of RIS and an important driver of their transformations; whilst, on the other hand, KIBS nature and development rely upon the technological, economic and institutional structure of the regions in which they are embedded (Koch and Stahlecker, 2006). Moreover, in the literature it is argued that KIBS tend to concentrate in core metropolitan cities (Keeble and Nachum, 2002; Martínez-Argüelles and Rubiera-Morollón, 2006; Simmie and Strambach, 2006; Wood, 2002 and 2003) and this tendency to concentration seems to be attributable to agglomeration and external economies (e.g., accessibility to high quality communication infrastructures and urban labour markets, and spatial proximity) (Chadwick, Glasson, & Smith, 2008). Thus, if it is true that KIBS determine the innovative capacity and the global competitiveness of a region, their localization strength the differences across regions and increase the regional income disparities (Corrocher and Cusmano, 2014; Krugman, 1993).

However, despite the growing importance assumed by KIBS, there are very few studies exclusively devoted to the analysis of their location and to the degree of their specialization within the different regions (some exceptions in this sense are: Chadwick et al., 2008; Jennequin, 2008; and Shearmur and Doloreux, 2009).

All the above lead to the formulation of four main hypotheses:

- H1. Each region is more specialised in KIBS than its own country.
- H2. The KIBS specialization degree varies depending on the data used.
- H3. Each region follows its own KIBS specialization pattern.
- H4. The KIBS specialization pattern varies depending on the data used.

### 3. Sample, Data, and Methods

This section is divided in three sub-paragraphs. The first one is devoted to the description of the sample used in this study. The second sub-paragraph describes the data used and the KIBS classification adopted; whilst, the different specialization indices are reported and explained in the third one.

#### 3.1. The Sample<sup>1</sup>

This study analyses three peculiar European regions. According to the European Commission's Regional Innovation Scoreboard 2016 report (RIS2016, hereafter) and to the European Innovation Scoreboard 2016 report, these regions have been identified as strong innovator region in a moderate innovator country. Actually, the RIS2016 identified three other regions of this type (i.e., Oslo og Akershus and Trøndelag, in Norway; and, Bratislavský kraj in Slovakia), but due to the specific knowledge that the authors have of both the Spanish and Italian territory, in order to ensure a more accurate analysis and comparison, the study focuses exclusively on the region located in the above-mentioned countries.

##### 3.1.1. Basque Country

The Basque Country (BC hereafter), also known as *País Vasco* or Basque Autonomous Community, is a NUTS 2 region with 2,1 million inhabitants, located in the northeast of Spain, on the border with France, and it is made up of three provinces (as called in the autonomous system): Araba, Gipuzkoa and Bizkaia.

The BC is one of the most important industrial concentrations in Spain. Services GDP share account for 69%, while industry generates 24%, construction 6.2%, and agriculture and fisheries 0.8% (Eustat, 2016).

This result arises from the combination of the performance of the Basque firms and the ten-year support of the Basque Government to the innovation and technology (even through development agencies as SPRI – *Sociedad para la Promoción y Reconversión Industrial*), and policies specifically devoted to science and technology

<sup>1</sup> The regions description are based on the information provided by the European Regional Innovation Monitor Plus (RIM Plus, available online at <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/>), unless otherwise specified.

improvements, in order to ensure a high level of competitiveness at regional level (Cooke and Morgan, 1998; Lopez-Rodriguez et al., 2010; Moso, 1999; Moso and Olazaran, 2002; Navarro and Buesa, 2004).

Moreover, the Basque Government has defined its smart specialisation strategy (RIS3) based on three priorities: 1. Advanced Manufacturing; 2. Energy; and, 3. Health. These focus points are a key aspect for the region's objective of developing a strong and competitive economy based on R&D. Moreover, during 2014-2015, the Basque Government has worked on restructuring the existing Basque Science, Technology and Innovation Network (RVCTI), to become a specialised and technology integrated provider for the Basque business sector with a market and client-oriented approach.

According to the RIS2016, the Basque Country has achieved also the classification of "innovation follower", standing out in two dimensions with respect to the European average (Eustat, 2016):

1. Human resource – with higher levels than the EU28 average in "population aged 30-34 with tertiary education" (44.2%) and "young people aged 20-24 with at least upper secondary education" (85.6%);
2. Linkages and Entrepreneurship, standing out in the indicator of "percentage of SMEs with internal innovation" (32.01%) and "percentage of innovating SMEs that collaborate in innovation" (14.6%) in comparison to the EU28 average of 10.3%.

### 3.1.2. Piemonte

Piemonte is the largest region of continental Italy with over 4.4 million of inhabitants, located in the Northwest, between Northern Europe and the Mediterranean basin.

The region is characterised by a significant industrial tradition, with a specialisation on the automotive industry (FIAT company borne here in 1899 and is the largest Italian company). Large firms and SMEs coexist forming strong and thick value chains. In recent years, new specialisations have emerged, for instance in ICT and telecommunications. The service sector and agro-industry also significantly contribute to the regional GDP. Piedmont is one of the most important Italian regions in RTDI (Research Technology Development and Innovation) thanks to the presence of large firms and their research departments and important universities (e.g. Polytechnic of Turin).

There are two important features of the region that are unique in the Italian panorama: the prevalence of the private sector in R&D expenditure and the international breadth of regional research.

According to the RIS2016, also the Piemonte is ranked as an innovation follower (i.e., the regions with a relative performance less than 20% above but more than 10% below that of the EU28). The region is relatively strong with regard to business R&D and SMEs introducing product or process innovations, while the main weaknesses relate to population with tertiary education and public R&D expenditure.

### 3.1.3. Friuli Venezia Giulia

Friuli Venezia Giulia is the Italy's most Northeast region and one of the five Italian autonomous regions with a special statute. It has about 1.2m inhabitants and it is characterised by an industrial development mainly driven by industrial clusters of SMEs working in traditional sectors (with the main specialisations in: furniture, electric appliances, and agro-food). Friuli Venezia Giulia is one of the most dynamic Italian regions in research and innovation. In 2013, the total R&D expenditure represented 1.46% of GDP, a result higher than the Italian average (1.3%), but still below the European average (2%). The amount of regional R&D expenditure represented about 3% of national R&D investment: it was about 526m, of which 44% in the public sector (Government and Higher Education sector) and 56% in the private sector (Business enterprise and Private non-profit sector).

The regional innovation system comprises a wide range of important organisations, both public and private. The most important example in this sense is the Area Science Park (one of the most relevant Italian Science and Technology Parks): a research-driven multi-disciplinary cluster, which mainly operate mainly in the following R&D areas: life sciences and biomedicine; physics, materials and nanotechnology; electronics and ICT; environment and energy.

According to the to the RIS2016, the Friuli Venezia Giulia is the third region ranked as an innovation follower (its innovation performance has improved in recent years). The region is relatively strong in relation to SMEs introducing product or process innovations and non-R&D innovation expenditure, while the main weaknesses relate to public and private R&D expenditure.

## 3.2. Data and KIBS classification

In order to achieve the paper aim properly, the identification of reliable data and KIBS firm's classification played a critical role.

As regards the first aspect, the data used for the analysis are from two Eurostat's REGIO databases: the Structural Business Statistics (SBS) and the Annual Enterprise Statistics for Special Aggregates of Activities (NACE Rev.2), and refer to the year 2014 . From all the data available, the chosen indicator has been the number of employed persons. Moreover, the data has been getting by NUTS 0 (national level) and NUTS 2 (regional level) in order to get the needed information to measure the Specialization Index and the Relative Specialization Index.

Concerning the classification, in general, the European Member States collect their data for the economic activities according to what is stated in the NACE (*Nomenclature statistique des activités économiques dans la Communauté européenne*), and in particular in the NACE Rev. 2. However, this paper relies on the previous work of Schnabl and Zenker (2013), which propose a new KIBS classification based on NACE Rev. 2, especially useful for studies at the regional level, as in this case. According to their approach, in this paper have been considered the KIBS belonging to sections J (divisions 62 and 63) and M (divisions 69, 70, 71, 72, and 73), and corresponding to the following activities: Computer programming, consultancy and related activities; Information service activities; Legal and accounting activities; Activities of head offices and management consultancy activities; Architectural and engineering



activities and technical testing and analysis; Scientific research and development; and, Advertising and market research.

### 3.3. Specialization indices

In order to achieve the paper aim properly, the identification of reliable data and firms classification play a critical role.

In order to achieve the paper aim, providing information related to the specialization patterns followed by KIBS firms in the BC region and in other European regions, this paper follows the formula and considerations made by Merino and Rubalcaba (2012). In particular, both absolute and relative specialization indices have been computed.

Regarding the former, the Specialization Index (SI) helps us to see how specialized is a region in a certain activity. In order to calculate SI, it is necessary to get both the employment data in each sector and the total employment in the region. Thus, the Specialization Index is computed through the following formula:

$$SI(s)_i = \frac{X_{i,s}}{X_i} * 100$$

where  $X_{i,s}$  measures the employment in sector  $s$  in region  $i$ , and  $X_i$  the total employment in that region. As pointed out by Merino and Rubalcaba (2012), this indicator proxies the weight (or share) that each activity has in a region, getting the specialization index.

However, this measurement may give only a partial view of a region's specialization regarding to an activity within a country. Thus, it is necessary to know the Relative Specialization Index (RSI) of each region within a country. In this sense, the regions that are above the average (in this case 100) are more specialized than the rest. This can be calculated, following Merino and Rubalcaba's proposal, by this formula:

$$RSI((s)_i) = \frac{SI(s)_i}{SI(s)_c} * 100$$

where  $i$  is the region,  $s$  is the sector, and  $c$  is the country. Thus, the Relative Specialization Index is the ration (in percent) between  $SI(s)_i$  (i.e., the specialization index of sector  $s$  in region  $i$ ) and  $SI(s)_c$  (i.e., the specialization index of sector  $s$  in the country  $c$ ).

After analysing the KIBS as a whole sector, the same methodology will be used to analyse and compare each single KIBS activity (according to Schnabl and Zenker, 2013). Thus, the previously mentioned formulas have been slightly modified as follows:

$$SI(a)_i = \frac{X_{i,a}}{X_i} * 100$$

$$RSI((a)_i) = \frac{SI(a)_i}{SI(a)_c} * 100$$

where  $i$  is the region,  $a$  is the activity, and  $c$  is the country.

## 4. Analysis and Discussion<sup>2</sup>

This section provides the main results of the analysis and it has been divided into two sub-paragraphs, one that consider KIBS as a whole and the second one that analyse each KIBS activities separately.

### 4.1. KIBS specialization indices: countries and regions

According to the first objective and hypothesis of this paper, this sub-paragraph is devoted to the measurements and comparison between the countries and the regions KIBS specialization indices, in order to verify if the KIBS weight in the three analysed regions is higher than the one of their respective country. Table 1 reports the results of this comparison.

**Table 1.** Specialization and Relative Specialization Indices of Strong Innovator Regions in Moderate Innovator Countries (national and local data, 2014).

	KIBS SI for Countries	KIBS SI for Regions	RSI for regions
<b>Italy</b>	6.195268		
Friuli Venezia Giulia		4.95182	79.9290684
Piemonte		6.714451	108.380315
<b>Spain</b>	6.24766781		
Basque Country		7.05396972	112.905646

Source: own elaboration on Eurostat data 2016 [Last date consultation: 2017/06/26]

As showed in Table 1, both the KIBS SI and RSI for Piemonte and Basque Country is higher than the one of their country (Italy and Spain, respectively). However, this is not true for the Friuli Venezia Giulia region. This could mean that, although KIBS can be triggers of innovation (Hauknes, 1998; Hertog, 2000; Mas-Verdú et al., 2011; Wong and He, 2005), they are not the “only way” to make innovative a region.

Thus, the first hypotheses of this study – *H1*: Each region is more specialised in KIBS that its own country – it is only partially verified.

However, in order to better understand why the Friuli Venezia Giulia has been included in RIS2016 as a *strong innovator* region, the EU28 KIBS Specialization Index has been taken into account, and both SI and RSI for the three regions have been recalculated, as showed in Table 2.<sup>3</sup>

<sup>2</sup> Please, note that all the numbers in the text have been rounded off to the nearest hundredth.

<sup>3</sup> Please, note that in the European Specialization Index referring to EU28, there are no available data on all KIBS activities. Structural Business Statistics does not offer data for:

**Table 2.** Specialization and Relative Specialization Indices of Strong Innovator Regions in Moderate Innovator Countries (EU28 data, 2014).

	EU28 SI	KIBS SI for Regions	RSI (regions to EU28)
<b>EU28</b>	6.606135164		
<b>Italy</b>			
Friuli Venezia Giulia		4.95182	74.9578971
Piemonte		6.714451	101.639625
<b>Spain</b>			
Basque Country		7.05396972	106.779071

Source: own elaboration on Eurostat data 2016 [Last date consultation: 2017/06/26]

According to Table 2, it is possible to see that, on the one hand, all regions keep the same specialization or lack of specialization that had with their local national average, but – on the other hand – the relative specialization index is lower than using national averages.

Thus, the second hypotheses of this study – H2: The KIBS specialization degree varies depending on the data used – is not verified.

#### 4.2. KIBS specialization indices “activity by activity”

The first results obtained in the previous sub-paragraph allow us to verify that the regions’ specialization in KIBS is higher than the one of their countries. At the same time, this result but does not provide information on the single KIBS activities. In other words, *Are there and what are the specific KIBS activities that make a region more specialized in KIBS than its own country?*

In order to provide an answer to this question, the RSI “activity by activity” has been computed for the three analysed region, as showed in Table 3.

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Information Service Activities’ data for Republic of Ireland, United Kingdom, Luxembourg and Malta  
 Computer programming, consultancy and related activities’ data for Republic of Ireland.  
 Scientific research and development activities’ data for Luxembourg

**Table 3.** Relative Specialization Index “activity by activity” of each Strong Innovator Region in European Moderate Innovator Countries (national and local data, 2014).

KIBS ACTIVITY							
	Computer programming; consultancy and related activities (J62)	Information service activities (J63)	Legal and accounting activities (M69)	Activities of head offices; management consultancy activities (M70)	Architectural and engineering activities; technical testing and analysis (M71)	Scientific research and development (M72)	Advertising and market research (M73)
<b>Italy</b>							
Friuli Venezia Giulia	65.2824908	99.7531476	83.0254643	65.1950419	89.2468543	89.2251318	63.7134464
Piemonte	168.427402	82.7095985	85.9544196	93.6273563	109.917274	135.697272	105.889748
<b>Spain</b>							
Basque Country	99.7064279	122.914038	94.8309001	139.424256	123.183658	323.546554	81.6503487

Source: own elaboration on Eurostat data 2016 [Last date consultation: 2017/06/26]

The calculation of the RSI “activity by activity” shows a much more exhaustive and detailed overview of the regions’ situation. In general, there is not any specialization pattern that makes the analysed regions to be similar. In particular, although the three regions are considered as strong innovators in moderate innovator countries, they are not specialized in all KIBS activities (i.e., the region is not above the average, in this case 100, in all the different KIBS activities). At the same time, there are not specialized in the same KIBS activities. In this sense, Piemonte and BC follow a different pattern, being relatively specialized in some activities, even though not the same activities neither with the same specialization degree (e.g., both Piemonte and Basque Country are specialized in the activity M71, the Basque Country more).

It is interesting to note that the BC’s RSI for the “Scientific research and development” activity it is more than three times higher than the same index for the other two analysed regions. The high relative specialization in research and development activities shown in the BC can be considered the result of decades of institutional support that the Basque Government has been giving to the technology and research centres, through funding programs like COMPITE (Compete) or ETORTEK. This confirms some previous studies that showed how the regional government’s support has been determinant in order to strengthen R&D in the BC (Moso, 1999; Moso and Olazaran, 2002; Navarro and Buesa, 2004; Lopez-Rodriguez et. al., 2010).

Moreover, according to the results of Table 3, Piemonte is the region more specialized in “Computer programming; consultancy and related activities”. This result is not surprising, but in line with the geo-localization of the management consulting firms in Italy (in fact, 41% of them is located in the northwest, according to 7th Report of the Observatory on Management Consulting in Italy, 2016). Moreover, Turin has earned the second place as “European Capital of Innovation Award” in 2016, and it is a city leader in the hi-tech sector thanks to the ICT District “Torino Wireless”.

Lastly, Friuli Venezia Giulia shows to be below the average in all the analysed KIBS activities, according to the results of Table 1.

Thus, the third hypotheses of this study – *H3: Each region follows its own KIBS specialization pattern* – it is verified, demonstrating how even if two (or more) regions show a high specialization degree in KIBS, the pattern followed may differ greatly, requiring a “case-by-case” analysis.

As for the first result obtained in this study, the same comparison has been done also by using the EU28 SI for each KIBS activity, comparing them with regional ones in order to calculate the corresponding Relative Specialization Indices. In this case, the results undergo significant changes, as showed in Table 4.

**Table 4.** Relative Specialization Index for each KIBS activity of each Strong Innovator Region in European Moderate Innovator Countries (EU28 data, 2014).

	KIBS ACTIVITY						
	Computer programming, consultancy and related activities (J62) (*)	Information service activities (J63) (**)	Legal and accounting activities (M69)	Activities of head offices; management consultancy activities (M70)	Architectural and engineering activities; technical testing and analysis (M71)	Scientific research and development (M72) (**)	Advertising and market research (M73)
<b>Italy</b>							
Friuli-Venezia Giulia	50.69067781	247.0888287	112.3927394	24.96202792	83.23092918	36.44325485	36.71963549
Piemonte	130.7808428	204.8719093	116.3577074	35.84825798	102.5080038	55.4244096	61.02688162
<b>Spain</b>							
Basque Country	87.68491314	69.18231608	116.2851998	64.61451735	133.4298102	236.7179425	97.83914457

Source: own elaboration on Eurostat data 2016 Last date consultation: 2017/06/26]

(\*) Except Republic of Ireland

(\*\*) Except Ireland, Luxembourg, Malta and United Kingdom

(\*\*\*) Except Luxembourg

According to Table 4, Friuly-Venezia Giulia seems to be highly specialized in “Information service activities” overcoming both Piemonte and BC, and relatively specialized in “Legal and accounting activities”. This is a significant change, considering that using the nation level data this region seemed not to be specialized in any KIBS activity.

The situation change also for the Basque Country that, through the use of the EU28 SI, does not seem to be specialized anymore in “Activities of head offices; management consultancy activities”. The same goes for the Piemonte region. Comparing Table 3 and 4, it is possible to see that in the latter Piemonte is not specialized anymore in “Activities of head offices; management consultancy activities”, “Scientific research and development”, and “Advertising and market research”; whilst, it is highly specialized in “Information service activities”.

All the above confirms the fourth hypothesis of this study – *H4: The KIBS specialization pattern varies depending on the data used* – underlining how, using national data or the 27 European Union Countries’ data in order to calculate the RSI, the results vary, and some regions “lose” or “gain” specialization in certain KIBS activities.

## 5. Conclusions

This paper has analysed the regional specialization of KIBS firms comparing three peculiar European regions: Basque Country, Piemonte and Friuli Venezia Giulia. Those regions have been chosen because, according to RIS2016, they are considered as *strong innovator* regions in *moderate innovator* countries.

In particular, the paper aims to verify the KIBS specialization degree and pattern of the three regions, both as a whole and with specific reference to each single KIBS activity. To achieve this aim, four hypotheses have been subject to verification throughout the study. The main conclusions of the study are summarized below, together with their theoretical and practical implications.

For what concerns the KIBS specialization degree of the three regions compared to the specialization degree of their countries, Piemonte and Basque Country result to be specialized in KIBS, whilst Friuli Venezia Giulia doesn't, indicating that probably this region could be considered more as a "*KIBS importer*". This situation does not change even when the indices are recalculated, taking into account the EU28 specialization index.

This is true considering the KIBS firms as a whole, but the situation changes the single KIBS activities, identified accordingly to the Schnabl and Zenker's (2013) classification.

In this case, it is interesting to note two things. On the one hand, the RSI computed using national data show that the three regions have different specialization patterns, and that the Friuli Venezia Giulia is not specialized in any of the KIBS activities. On the other hand, there is to note that the RSI computed through the EU28 data show that the regions "lose" or "gain" specialization in the different KIBS activities. Even more interesting are the results related to the Friuli Venezia Giulia. In fact, the RSI recalculation shows a high region specialization in "Information service activities" and a discreet specialization in "Legal and accounting activities".

All of the above has important implications both from a theoretical and practical point of view.

First of all, there is not a "wrong or right interpretation" regarding to the different results achieved in this study through the RSI measurements with different data (i.e., national and European averages). In fact, the use of the achievement of different results through the use of different averages is not just a "methodological issue" but also, and more importantly, a "content" one that opens to a new and interesting debate related to specialization indices measurements: Should we use national or European data in order to talk about "country specialization"?

This question is fundamental both for Scholars as well as practitioners. For the former it means reconsidering the different measurements made and then revising the results achieved in a different perspective. For the latter, this leads to the possibility of reconsidering the specialization degree of their region and the different policies adopted in this context.

Moreover, exclusively related to the *theoretical implications*, it is interesting to note that the results are partly in conflict with one of the main assumptions of the KIBS

literature – at least at regional level – which defines KIBS as “bridges of innovation” (Bessant and Rush, 1995; Chun-Yao et al., 2011; Colombo et al., 2011; Corrocher and Cusmano, 2014; Czarnitki and Spielkamp, 2003; Muller and Zenker, 2001; Strambach, 1998, 2001; Thomi and Böhn, 2003; Yam et al., 2011). In fact, the direct link between KIBS and innovation should be verified case-by-case. As showed by the results obtained for the Italian region of Friuli Venezia Giulia, despite it has been classified as a strong innovator region by the RIS2016, its being innovative does not derived from a specialization in KIBS firms at national level.

Finally, with specific regard to the *policy makers*, the results achieved by this study provide useful information related to the importance of the policies that aim to promote the KIBS firms development. In fact, taking as example the BC, the support given during the last decades by the Basque Government to research and development activities has proved to be useful, helping not only the firms specialization, but also in order to obtain remarkable regional results (e.g., R&D over GDP clearly over Spanish average and one decimal below the EU average).

Furthermore, to our knowledge, this is the first study that analyses the KIBS firms specialization related to strong innovator regions in moderate innovation countries by using the relative specialization index method. Further research can adopt this method for a deep analysis of specific regions and to make different types of comparisons between regions.

Finally, despite the numerous and important implications derived from this study, obviously it is not free from limitations. First of all, it strictly follows the previous study of Merino and Rubalcaba (2012) and Schnalb and Zenker (2013) concerning the specialization indices and the KIBS classification, respectively. Thus, different results could be achieved by adopting other kinds of indices and classifications. At the same time, these limits may represent the starting point of future researches on the topic. In particular, the sectors that benefit from the KIBS and the input that these activities can offer to the Smart Specialization Strategies at regional level and the correspondence between KIBS firms’ concentration and specialization.

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## LATIN AMERICA'S FALTERING MANUFACTURING COMPETITIVENESS: WHAT ROLE FOR INTERMEDIATE SERVICES?

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### Abstract

Latin America's share in global exports of manufactures stagnated around 5% from 2000 to 2016, which contrasts the performance of developing Asia (which share rose from 23% to 37%). The former region's underperformance is often explained by the overvaluation of its exchange rate during this period due to the growing specialization in natural resources. This paper analyzes another potential explanation of the region's stagnant performance: the insufficient incorporation of domestic and foreign intermediate services as a source of value added. A growing literature shows that a country's manufacturing export performance depends critically on its degree of (business) servicification. We compare Latin America and ASEAN in terms the role of intermediate services in exports of manufactures using international input output tables between 1995 and 2011: domestic services value added intensity of manufacturing exports is higher in Latin America, whereas the imported services value added intensity is higher in ASEAN. Regressions seems to suggest that total domestic services content of manufacturing exports is negatively associated to global exports market shares, whereas total imported services are positively associated. However, some types of domestic business services are positively associated to changes global export market shares, while domestic finance and real estate services may be negatively associated.

## 1. Introduction

From 1990 to 2016, Latin America's share in global exports of manufactures has stagnated around 5%. The region slightly gained market share in global trade in medium-tech manufactures, but lost in global trade of resource based, low and high tech manufactures. This overall disappointing performance differs strongly from that of developing Asia (ASEAN, China and India), which increased its global exports share from 23% to 37% during the same period. Latin America's overall underperformance in trade in manufactures is often explained by its growing specialization in natural resources, which has been exacerbated by the fast rising demand for these products by China and the rest of Asia since the early 2000s. The region's growing overdependence on these export goods led to a stronger concentration in the terms of goods and export firms. Also, it led to an appreciation of several of its currencies, which in turn dampened the competitiveness of its manufacturing exports.

This paper analyzes another potential explanation of the region's stagnant performance in global manufacturing exports in terms of global market share: the insufficient incorporation of high quality domestic and foreign intermediate services. A growing body of literature has shown the increasing role of services as a source of value added into exports of manufactures. Increasing evidence on developed countries show that the "servicification" is a key condition of successful manufacturing export performance and diversification. Services play a key role in manufacturing dominated global value chains (GVCs), as logistics and information technology facilitate the movement of goods and information between segments, R&D, innovation and other intermediate services improve the productivity of firms, contribute to the diversification, differentiation and value of products, overcome domestic market barriers, and outsource non-core inputs and services. Baldwin *et al.* (2015) and Lodefalk (2017) summarize several studies that confirm this growing services value added share in manufacturing production and exports in the cases of France, Germany, Sweden, the United States and other OECD countries using both international input - output tables (IIOTs), micro firm-level data and case studies. However, few studies have been conducted in this area on Latin America.

This paper uses international IOTs and case studies to explore the question whether the incorporation of more and different services could revitalize Latin America's manufacturing export performance. In particular, we use the 2016 version of OECD's TIVA database includes seven countries from the region (Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru) with data between 1995 and 2011. After looking at broad measures of Latin America's export manufacturing performance, the paper reviews motivations of manufacturing firms to incorporate different types of services within their products, as well as available evidence on the role of services in manufacturing exports. Using OECD's TIVA database, the domestic and imported intermediate services value added contents of exports of manufactures are compared between seven Latin American countries and eight ASEAN countries (Brunei Darussalam, Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam) between 1995 and 2011. In addition to the total contents of services, the paper focuses on business services which are of strategic importance to improve the manufacturing sector's international competitiveness.

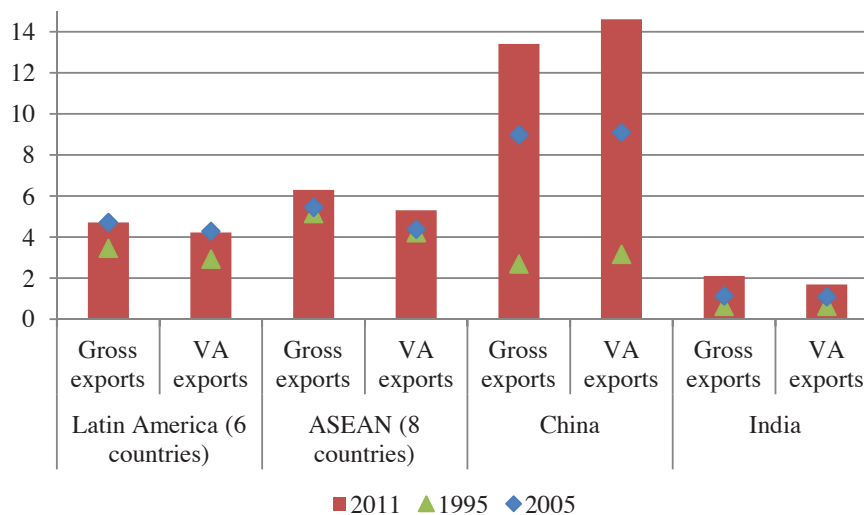
In the final part of the paper, panel regressions are carried out to test whether intermediate services intensities of manufacturing sectors help to explain their export performance in terms of either global export market shares and other trade performance variables such as the degree of product diversification, building on the approaches of Evangelista *et al.* (2015), Francois and Woerz (2007), and Wolfmayr (2008). Possible control variables are unit labor cost, share of each country in global patents per sector, openness of specific intermediate service sectors, and direct exports of these services. A distinction is made between three groups of manufacturing industries: natural resource intensive ones, labor intensive ones and technology intensive ones.

This paper complements the previous ones by making the distinction between domestic and imported intermediate services and the use of a new dataset. Some conclusions and policy recommendations are made at the end on which intermediate services are most strategic for the export performance of manufacturing sectors.

## 2. Latin America’s stagnant manufacturing export performance

A major motivation for this study is the stagnating performance of Latin American manufacturing exporters. This stagnation can be illustrated with two different output measures estimated using the TiVA database (Figure 1). A comparison is made with the performance of ten emerging economies from the Association of Southeast Asian Nations (ASEAN), China and India. A first measure is gross exports, which shows that Latin America’s share in global manufacturing exports first increased between 1995 and 2005, but stagnated afterwards. ASEAN’s market share increased little until 2005, but rose substantially afterwards. China and India’s market shares rose continuously over this period. Alternative and more recent gross export statistics from UN COMTRADE until 2016 confirm the stagnation of Latin America’s market share and continuous rise of that of ASEAN, China and India.

**Figure 1**  
**Latin America, ASEAN, China and India: Participation in world manufacturing exports, 1995-2011**  
(Percentage)



Source: Author based on calculations using the OECD-WTO 2016 version of the TiVA database.

A second and more accurate measure of the “true” participation of a country in global exports is its share in global value added exports, which equals gross exports minus imported intermediate inputs. This measure shows slightly lower shares in world manufacturing exports for Latin America, ASEAN and India, which reflects the fact that their manufacturing sectors have a higher imported content of intermediate inputs than the rest of the world. The trends over time are similar.

Latin America’s overall underperformance in trade in manufactures is often explained by its growing specialization in natural resources, which has been exacerbated by the fast rising demand for these products by China and the rest of Asia since the early 2000s. The region’s growing overdependence on



natural resources led to a stronger concentration of export in the terms of goods and export firms. Also, it contributed to an appreciation of several of its currencies, which in turn increased the international prices of its manufacturing goods and dampened these exports, also referred to as Dutch Disease. This paper explores another potential explanation of the region's stagnant performance in global manufacturing exports in terms of global market share: the insufficient incorporation of domestic and foreign intermediate services.

### 3 Literature review

#### 3.1 Motivations for using services to improve manufacturing export performance

Manufacturing firms increasingly use different types of services at each stage of their value chains. This servicification has different origins (Lodefalk, 2017). First, several “cost” services are important to reduce expenditures, improve production efficiency and increase productivity (Arbache et al., 2016). Examples are transport and logistics, finance, information technology and communication (ICT) services, insurance, management, renting and leasing of machinery, equipment and buildings, and financial and insurance. These services improve the coordination of the production process and save time and materials (Nordas, 2010; USITC, 2013). As many manufacturing firms do not consider these services as part of their core competencies, these are outsourced to specialized providers. The importance of cost services increases with the lengths of supply chains.

Second, services are essential to establish and operate international production networks and global value chains (USITC, 2013). From the 1980s until recently, countries increasingly specialized in different types of manufacturing and business services segments of the value chain.<sup>1</sup> These business-to-business (B2B) and business-to-customer (B2C) services include accounting, customer relations, headquarters functions, IT services and logistics. These trends were facilitated by technological developments in these areas, including containerization and the spread of high-quality ICT infrastructure. These services greatly reduced coordination costs, levels of inventory and delivery times of intermediate and final products.

Third, manufacturers add services to differentiate their goods and make them more attractive to customers in an often highly competitive environment. Firms also combine services with goods to adapt to changes in consumer demand. Using wireless networks and digital technologies, manufacturers build in sensors and microchips in their goods that allow communication with each other (internet of things) to provide additional services and collect information on consumer behavior. Also, services can help to limit the environmental and social impacts of their goods production and consumption through repurchasing and recycling. In short, services help to produce premium product and increase customer loyalty. This category can be referred to as “value” services, and generally require a higher content of human capital and other capabilities. Value services play are more important for sophisticated and differentiated products (Arbache et al., 2016).

Fourth, firms use services to overcome barriers to foreign market entry in the form of exports or foreign direct investment (FDI) and to sustain foreign market sales (Lodefalk, 2017). Through the establishment of affiliates abroad, multinational companies provide different types of services including distribution, maintenance, marketing, matchmaking, monitoring reparation and translation. These establishments and their local workers can help firms to improve their knowledge about local markets and networks.

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<sup>1</sup> Lewis and Monarch (2016) conclude that the fragmentation of supply chains has slowed or stalled between 2011 and 2015.

### 3.2 Research findings on role of services in manufacturing export performance

Miroudot and Cadestin (2017) show multiple stylized facts on the servicification of manufacturing on the basis of the 2015 version of the OECD international input-output table called Trade in Value Added (TiVA). In 2011, the share of services value added in the world gross value of exports was above 30% for all sixteen different manufacturing industries, except for coke and petroleum. Distribution services account for about one third, whereas business services (including telecoms, computer services, R&D and other business services) account for another third. The rest is split between transport, finance and other services. From 1995 to 2011, the domestic services value added share of world gross value of manufacturing exports fell one percentage points, whereas the foreign services value added share slightly increased two percentage points. In many countries, except for China and the United States, manufacturing exports have increased their share of services value-added during this period. These results confirm those of De Backer et al. (2015), who analyzed trends between 1995 and 2009 with the same database.

From the late 2000s, there is also a growing body of meso and firm-level literature on the importance of intermediate services for the export and productivity performance of manufacturing firms. The ESCIP consortium (2014) analyzed the contribution of the domestic and imported services contents of manufacturing in the European Union to another competitiveness variable being labor productivity growth. In the EU, services represented about 25% of total costs in manufacturing in 2011, which is only slightly higher than the level in 1995. The main categories are distribution (12%) and business services (9%). Within business services, the key items are legal and accounting activities, architectural and engineering activities, advertising and market research, other professional and scientific activities, computer programming and scientific research and development. Regression show that only imported business services inputs in manufacturing impact significantly labor productivity in manufacturing for all EU-27 countries. When splitting the sample by country size results are slightly different: in larger economies only domestic backward linkages affect positively labor productivity growth, whereas in smaller nations only foreign backward linkages play a role. Another outcome is that only in medium-high- and high-tech industries there is a positive effect of business services inputs on labor productivity.

On the basis cross-country statistics on production and trade in goods and services for 78 countries for the period 1994 to 2004, Francois and Woerz (2008) find a growing importance of services in production as the level of development increases, as well inverted U-pattern in pattern with respect to density of intermediate linkages. Using panel regressions, they show that an increased import intensity by business services between 1994 and 2004 contributed positively skilled and technology intensive manufacturing exports. Also, they confirm that the protection of intermediate services has a negative impact on export performance of technology intensive industries.

Wolfmayr (2008) looks into the determinants of export market shares of 18 manufacturing industries for 16 OECD countries from 1995 to 2000. She shows that services value added as a share of gross output increased in most countries over this period and reached over 20% in Ireland, Sweden and the UK. The author also shows that manufacturing in these countries purchased most services at home and imported little from abroad. Using regression analysis and controlling for unit labor cost, R&D intensity and patent performance at the industry level, the author shows that total and domestic services value added does not significantly contribute to export market shares, whereas imported services do. Separate regressions for technology-driven industries show that total services inputs and imported services significantly affect market shares, whereas domestic services have no impact. Another set of regressions for the non-technology industries show that total, domestic and imported services do all not affect market shares of these industries. Another set of regressions focus exclusively on links between export market shares and purchases of a subset of services: computer and related activities, research and development and business services. These knowledge intensive business services (KIBS) are more crucial for shaping international

competitiveness. These regressions show that total and imported KIBS significantly affect market shares, but not domestic ones.

Nordas and Kim (2013) show that the production of manufacturing industries in both developed and emerging economies became more services intensive between 1995 and 2005. This rising intensity is mostly linked to the growing importance of imported services, in particular in low-tech sectors where geographical fragmentation is largest requiring transport, logistics and other supply chain management services. Other evidence points to a positive link between business services intensity of production and export prices obtained in high-income markets. These authors also provide econometric evidence on the importance of service performance for manufacturing competitiveness across countries and industries. They show that indicators like telecommunications density, interest spread between banks' deposit and lending rates, transport costs, time for exports and imports, etc. impact significantly manufacturing performance dependent on the income of the country and the technological character of the industry.

Evangelista *et al.* (2015) looked into the role of three types of business services (post and communication, computer services and other business services) to explain changes in export market shares between 2000 and 2007 of five European countries (France, Germany, Italy, Spain and the United Kingdom). They confirm all three types of business services contribute significantly to each country's industrial competitiveness, controlling for unit labor cost and different types of innovation expenditure. Separate regressions for medium high tech sectors and medium low tech sectors show that communication and computer related services affect significantly market shares of both types of sectors, whereas other business services contribute to medium high-tech manufacturing industries only.

## 4 Stylized facts based on international input-output tables

### 4.1 Methodology and data sources to calculate services contents of manufacturing exports

The estimations of the services content in manufacturing exports in this paper are based on the OECD TiVA Inter-Country Input-Output (ICIO) tables. This database covers 63 countries and 34 sectors, including 16 in manufacturing and 15 in services. Annual data are available from 1995 to 2011. The TiVA database distinguishes 16 manufacturing industries, which can be divided into three groups following Francois and Woerz (2008): natural resource intensive ones, labor intensive ones and technology intensive ones (see table 1).

**Table 1: Manufacturing industries in TiVA and their intensity**

ISIC Rev.3	Category	Intensity
15, 16	Food products, beverages and tobacco	Resource
17, 18, 19	Textiles, textile products, leather and footwear	Labor
20	Wood and products of wood and cork	Resource
21,22	Pulp, paper, paper products, printing and publishing	Resource
23	Coke, refined petroleum products and nuclear fuel	Resource
24	Chemicals and chemical products	Technology
25	Rubber and plastics products	Resource
26	Other non-metallic mineral products	Resource
27	Basic metals	Resource
28	Fabricated metal products except machinery and equipment	Resource
29	Machinery and equipment n.e.c	Technology
30, 32, 33	Computer, electronic and optical products	Technology
31	Electrical machinery and apparatus n.e.c	Technology
34	Motor vehicles, trailers and semi-trailers	Technology
35	Other transport equipment	Labor

<b>36,37</b>	<b>Manufacturing n.e.c; recycling</b>	<b>Labor</b>
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Source: Authors based on OECD TIVA database and Francois, J. and J. Woerz (2008), "Producer Services, Manufacturing Linkages, and Trade," *Journal of Industry, Competition and Trade*, 8:3, 199-229.

The TIVA sector classification distinguishes 15 services sectors (Table 2). In this paper, these sectors are split into four groups. First, distribution services contain three industries that are crucial for the sale and movement of goods from the manufacturer to the consumer. Second, financial services, insurance and real estate are important for payments, loans, insurance and non-residential investments. Third, business services include three industries that are more crucial for international competitiveness as confirmed by prior studies: Renting of machinery and equipment, Computer and related activities; and Research and development and Other Business Activities (Arbache et al., 2016; Evangelista et al., 2015; Wolfmayr, 2008).

**Table 2: Service industries in TIVA and groupings**

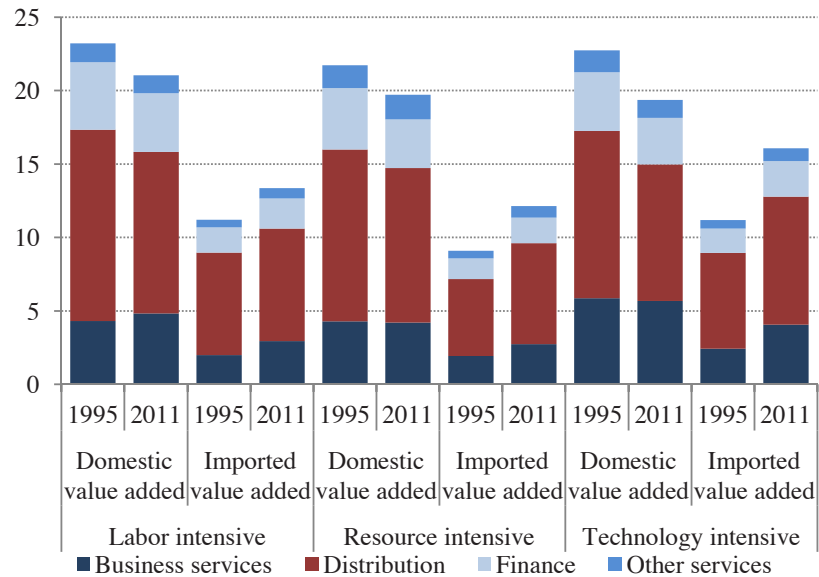
ISIC rev3	Name	Category
<b>50, 51, 52</b>	Wholesale and retail trade; repairs	Distribution
<b>60, 61, 62, 63</b>	Transport and storage	Distribution
<b>64</b>	Post and telecommunications	Distribution
<b>65, 66, 67</b>	Finance and insurance	Finance
<b>70</b>	Real estate activities	Finance
<b>71</b>	Renting of machinery and equipment	Business services
<b>72</b>	Computer and related activities	Business services
<b>73, 74</b>	Research and development, Other Business Activities	Business services
<b>55</b>	Hotels and restaurants	Other
<b>75</b>	Public admin. and defense; compulsory social security	Other
<b>80</b>	Education	Other
<b>85</b>	Health and social work	Other
<b>90, 91, 92, 93</b>	Other community, social and personal services	Other
<b>95</b>	Private households with employed persons	Other

Source: Author based on OECD TIVA database and Wolfmayr, Y. (2008), *Producer Services and Competitiveness of Manufacturing Exports*, FIW Research Report, N° 009, WIFO, Vienna.

### 4.3 Servicification of manufacturing exports

A first set of results shows trends at the global level between 1995 and 2011. During this period the total domestic services value added share of global manufacturing exports fell, whereas the total foreign (imported) value added share increased for all three types of manufacturing industries: labor intensive, resource intensive and technology intensive (Figure 2). In 2011, the domestic value added intensity is highest in the labor intensive industries, while the imported intensity is highest in technology intensive industries. Both types of industries are highly competitive and geographically fragmented industries, in which both domestic and imported outsourced services are essential to differentiate products and coordinate different actors in the value chain. The lower domestic services content in technology intensive industries does not necessarily mean they use less domestic services. This is because services may be produced within the firm (such as R&D services), which are not accounted for in the input-output statistics. In particular imported intermediate business services increased their share from 1995 to 2011 across all three types of industries, even though the absolute share of domestic ones are higher than the import shares across the board. Business services include renting of machinery and equipment, computer and related services and R&D and other business services. These are considered most crucial for international competitiveness of manufacturing products.

**Figure 2**  
**World: Value added content of services in manufacturing exports, 1995 and 2011**  
(Percentage)



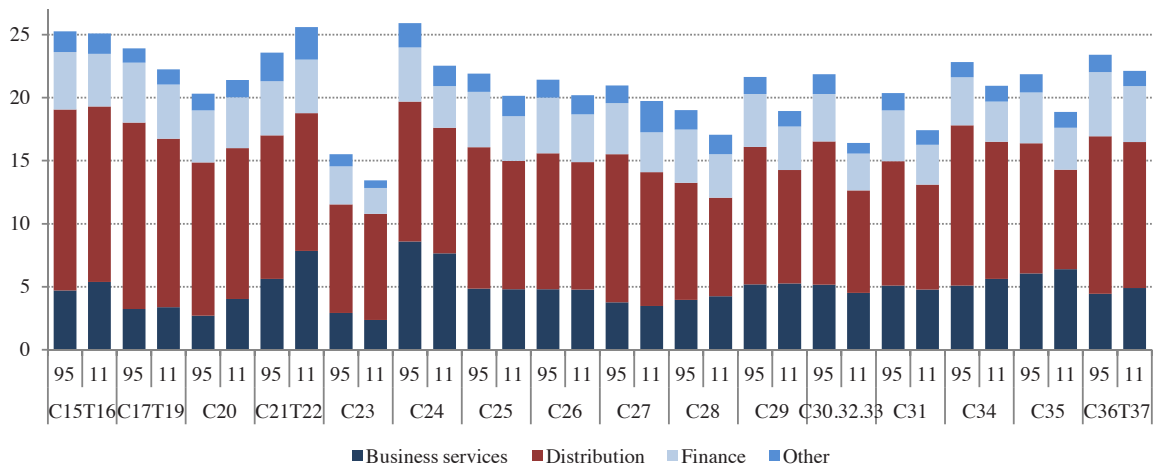
Source: Author based on calculations using the OECD-WTO TIVA database.

Previous findings are confirmed at the level of individual manufacturing industries (see Figure 3). The highest domestic services content is in Pulp and paper, together with Food and beverages in 2011. The lowest domestic share is in Petroleum and fuels. The domestic services value added share in manufacturing exports between 1995 and 2011 fell in all but two industries. The largest percentage points drop was in Computer, electronic and optical products. The highest imported services content is in Computer, electronic and optical products, together with Electrical machinery and apparatus and Motor vehicles, trailers and semi-trailers industries in 2011. The share of imported services value added share in manufacturing exports between 1995 and 2011 increased in all industries, and most in terms of percentage points in Computer, electronic and optical products and least in Textiles and clothing.

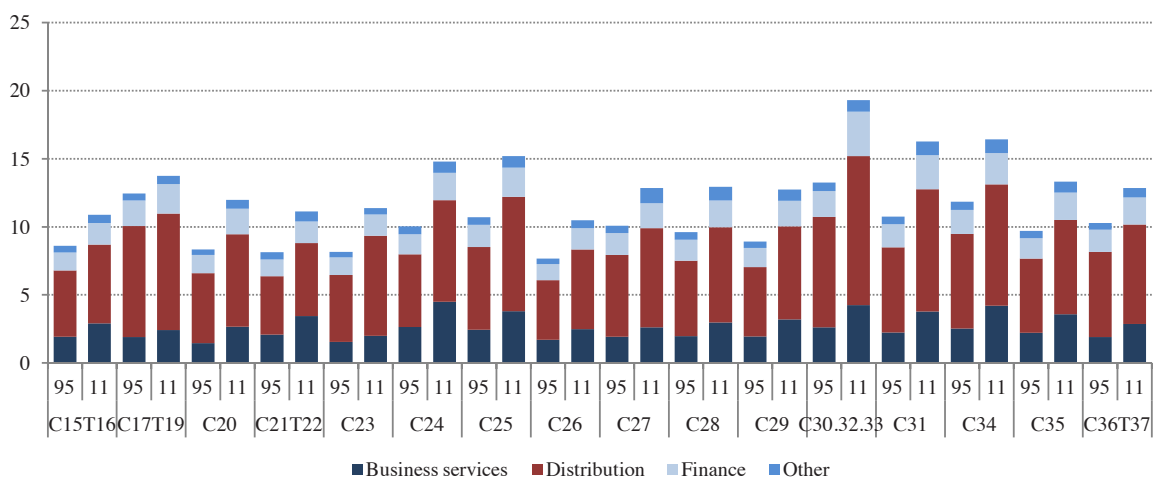
When focusing on business services value added incorporated in manufacturing exports only, the results change as the domestic content increased over time in 11 out of 16 industries. Moreover, the imported contents increased in all industries. The highest domestic content of business services in 2011 was in Pulp and paper and Other transport equipment, while the highest imported content of business services was in Chemicals and chemical products and Motor vehicles. The lowest domestic and imported content of this category was in Petroleum and fuels.

Figure 3  
World: Value added content of services in manufacturing exports by industry, 1995 and 2011  
(Percentage)

A. Domestic services value added



B. Imported services value added



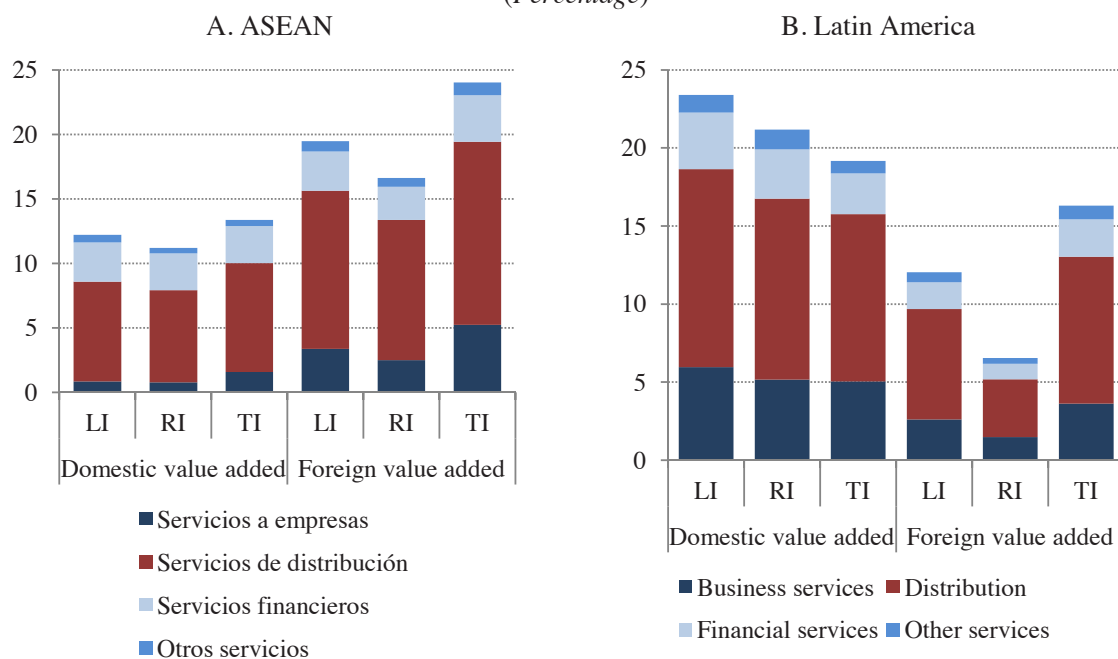
Notes: 15, 16 = Food products, beverages and tobacco; 17, 18, 19 = Textiles, textile products, leather and footwear; 20 = Wood and products of wood and cork; 21,22 = Pulp, paper, paper products, printing and publishing; 23 = Coke, refined petroleum products and nuclear fuel; 24 = Chemicals and chemical products; 25 = Rubber and plastics products; 26 = Other non-metallic mineral products; 27 = Basic metals; 28 = Fabricated metal products except machinery and equipment; 29 = Machinery and equipment n.e.c; 30, 32, 33 = Computer, electronic and optical products; 31 = Electrical machinery and apparatus n.e.c; 34 = Motor vehicles, trailers and semi-trailers; 35 = Other transport equipment; and 36,37 =Manufacturing n.e.c; recycling.

Source: Authors based on calculations using the December 2016 release of the OECD TiVA database.

The ASEAN and Latin America differ in several respects with regard to the services content of manufacturing exports (Figure 4). In Latin America, the domestic services value added intensity of manufacturing exports is higher than in ASEAN for all three types of industries. In contrast, in ASEAN the imported services value added intensity of manufacturing exports is higher than in Latin America for all three types of industries. Multiple possible explanations can explain these results, which require further investigation. First, as ASEAN countries are more integrated in regional production networks and value

chains, they import relatively more business services. The causality could also run the other way, as these countries may first have imported proportionally more business services, which helped it in turn to insert better into international production networks. Second, Latin America may have a more developed domestic services sector than ASEAN and therefore can more easily subcontract business services at home instead of importing these from abroad. Third, there may be a composition effect: Latin America may export proportionally more manufacturing goods which are more intensive in domestic business services compared to ASEAN. In similar vein, ASEAN may export relatively more manufactures that are intensive in imported business services.

Figure 4  
**ASEAN and Latin America: Services value added shares in manufacturing exports, 2011**  
*(Percentage)*



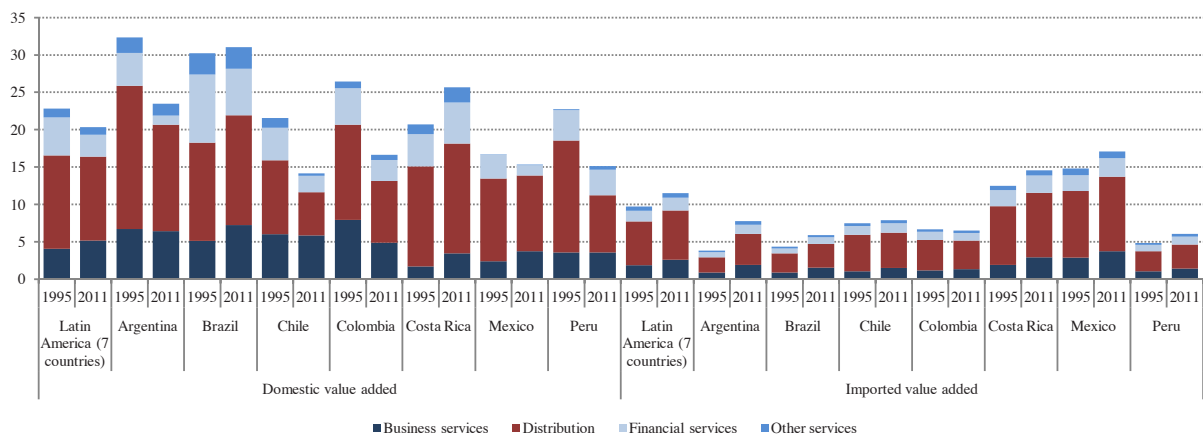
Notes: LI are labor intensive industries, RI are resource intensive industries and TI are technology intensive industries.

Source: Author based on calculations using the OECD-WTO TIVA database.

A comparison of seven Latin American countries included in the TIVA database shows that Brazil and Costa Rica are the countries with the highest domestic services content of manufacturing exports. Both countries have the highest share of distribution services of all seven, while Brazil also has the highest share of the other three types of services (Figure 5). Arbache (2014) argues that this high domestic services content in Brazil contributes little to the international competitiveness of the manufacturing sector, as it mostly reflects the high prices of key services such as finance, logistics and telecom. In turn, these high prices result from low productivity, little competition and reduced investment levels. In the case of Chile, a potential explanation may be the concentration of Chilean manufacturing in food products, which are highly business services intensive. Brazil and Costa Rica are the only countries in the region where the domestic services contents increased between 1995 and 2011. In the other five countries, this content fell up to 9 percentage points. This results in part from the increasing export specialization in natural resource based manufactures, which are least intensive in services.

Mexico is the first country and Costa Rica the second in terms of the foreign services value added contents of exports in 2011. This may result from the fact that the manufacturing sectors in these two economies are the most integrated in global and regional production networks with a concentration in both labor and technology intensive products, which are highly intensive in the use of services. Both countries have the highest share of both services aimed to reducing costs and adding value to manufacturing exports.

Figure 5  
**Selected Latin American countries: Services value added in manufacturing exports, 1995 and 2011**  
(Percentage)



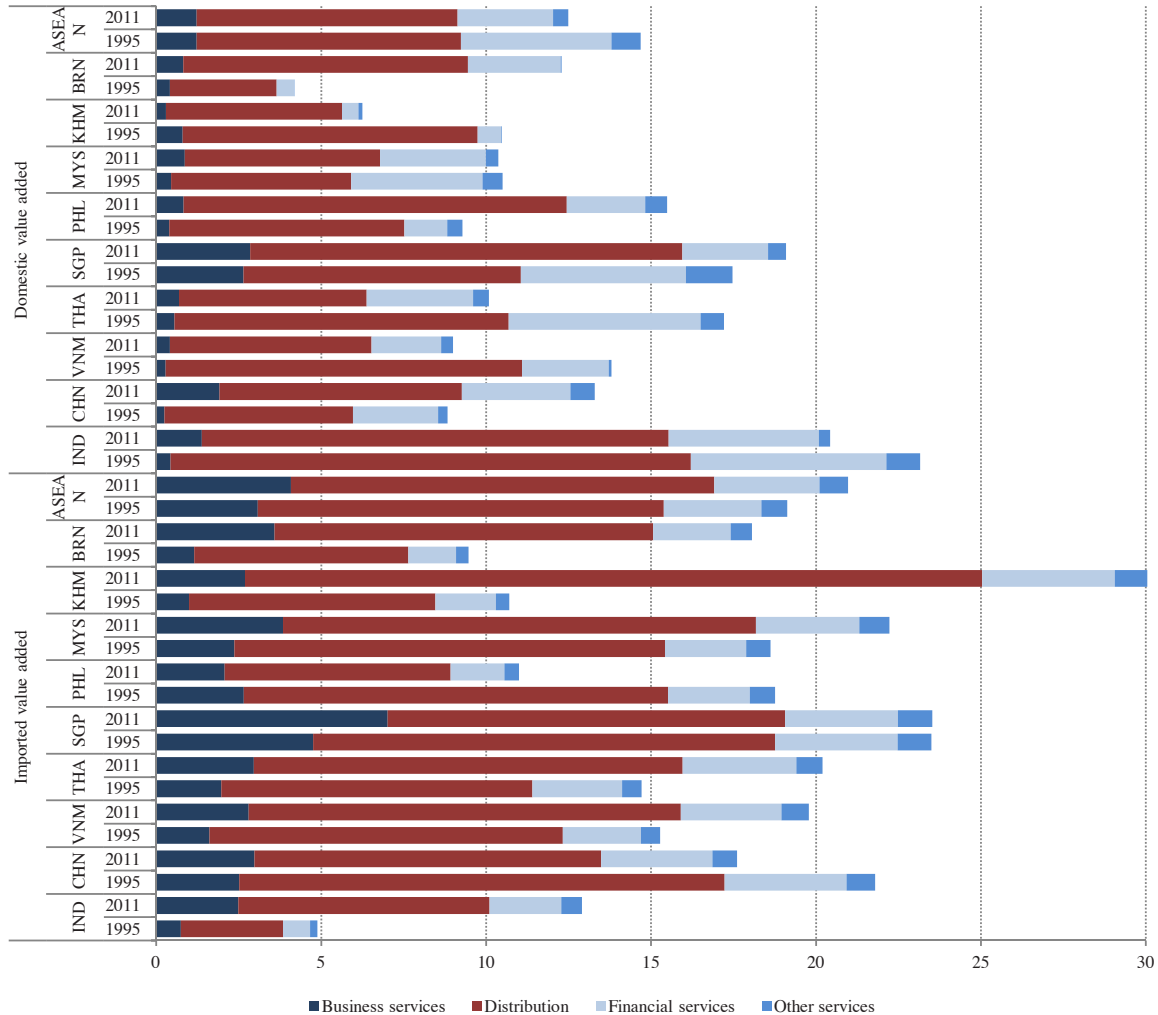
Source: Author based on calculations using the December 2016 release of the OECD TiVA database.

ASEAN countries, China and India also show interesting differences. India and Singapore are the countries with the highest domestic services value added contents (almost 20%) of manufacturing exports in 2011. While two thirds of this content is concentrated in distribution services, the business services content of these two countries is also the highest within this region (Figure 6). This result reflects the fact that both countries probably have the most developed domestic business services sector within the Asian sample. The business services content increased in the value of manufacturing exports in all countries between 1995 and 2011, except Brunei, as a result of the increasing depth of regional value chains which require proportionally more of these services. Financial services and real estate also are important services, in particular in India, Thailand and Malaysia.

The imported services content is higher than the domestic one in 2011 in all countries, except for India and the Philippines. This content is higher in particular in Cambodia (21 percentage points), Malaysia (9 points), Vietnam and Thailand (8 points). In these countries, the imported service content is especially high in distribution services, which may be explained by the underdeveloped nature of these services in the domestic market.



Figure 6  
ASEAN, China and India: Services value added share of manufacturing exports, 1995 and 2011  
(Percentage)



Notes: the country codes are BRN = Brunei, KHM = Cambodia, MYS = Malaysia, PHL = Philippines, SGP = Singapore, THA = Thailand, VNM = Vietnam, CHN = China and IND = India.  
Source: Author based on calculations using the TiVA database.

## 5 Regressions

*Different types of domestic and imported services have different effects on manufacturing competitiveness*

The previous section showed the heterogeneity both across industries and countries in terms of the intensity of manufacturing exports in different types of both domestic and imported services inputs. According to the reviewed theoretical and empirical studies, two types of services can be distinguished: “cost services” and “value services” (Arbache, 2016). “Cost services” improve production efficiency, increase productivity, smoothen international production networks and minimize costs associated to exports. These are in particular distribution services (Wholesale and retail trade; Transport and storage, and Post and telecommunications) and financial services (Finance and insurance, and Real estate

activities). Manufacturing firms certainly need to contract a certain amount of these intermediate services to achieve the above objectives. However, if these services are too expensive they may hinder export competitiveness instead of supporting it. Therefore their expected effect on global export market shares may be either positive or negative. “Value services” refer in particular to business services used to differentiate goods and add characteristics that support their competitiveness. These are in particular Renting of machinery and equipment, Computer and related activities, and Research and development and Other Business Activities. As these activities add value to the product, their effect on global export competitiveness is expected to be positive.

Another differentiation among the intermediate services is their origin: domestic or imported. In particular within the context of emerging countries, it is likely that imported services are of superior quality than those subcontracted domestically. In other words, the effects of domestic versus imported cost services may be different. This is what can be tested using regression analysis.

#### *The model*

Several regressions have been performed to test whether and how different domestic and foreign cost and value services contribute to manufacturing export performance. The latter is measured by the change in the share of a country’s manufacturing sector in world exports of that same industry.<sup>2</sup> Following a literature review, several standard control variables were included (Basarac Sertić et al. 2015; Nordas and Kim, 2013; and Evangelista et al., 2015) (see Table 7). The contribution of multiple intermediate domestic and imported cost and value services to the competitiveness of manufacturing sectors is empirically tested as follows:

$$\Delta Q_{ijt} = \beta_0 + \beta_1 Q_{ijt-1} + \beta_2 ULC_{ijt-1} + \beta_3 PMR_{ijt-1} + \beta_4 Cost_{ijt-1} + \beta_5 Manuf_{ijt-1} + \beta_6 REER_{jt-1} + \beta_7 FDI_{jt-1} + \beta_8 DomS_{ijt-1} + \beta_9 ImS_{ijt-1} + \varepsilon_{ijt} \quad (1)$$

Where  $\Delta Q_{ijt}$  is the change in global export market share of sector  $i$  in country  $j$  at year  $t$ ,  $ULC$  is the unit labor costs,  $PMR$  is product market regulation,  $Cost$  is the cost to export,  $Manuf$  is the size of the manufacturing sector,  $REER$  is the real effective exchange rate,  $FDI$  is foreign direct investment,  $DomS$  is the domestic intensity of different types of (cost and value) services, and  $ImS$  is the imported intensity of different types of (cost and value) services.<sup>3</sup>

The control variables are measured as follows (see also Table 3):

- Unit labor cost ( $ULC$ ) is measured by the ratio of  $i$ ) labor cost as measured by wages and salaries (in USD) divided by number of employees, and  $ii$ ) labor productivity as calculated by the division of value added and the number of employees;
- Product market regulation ( $PMR$ ) is measured for 36 OECD countries and 11 non-OECD countries for the years 1998, 2003, 2008 and 2013 in three broad areas: state control, barriers to entrepreneurship and barriers to trade and investment;
- Cost to exports ( $Cost$ ) refers to the cost of shipping a container abroad as estimated by World Bank’s Doing business data from 2004 onwards;

<sup>2</sup> A more detailed bilateral gravity trade model would have been more precise. However, data quality of bilateral incorporated intermediate services was too poor, especially for emerging economies, to estimate such a model.

<sup>3</sup> Another variable that affects the contribution of indirect services to manufacturing performance is the restrictiveness of service trade. However, data on this type of restrictiveness is available for one year only and could therefore not be included in the regressions.

- Real effective exchange rate (*REER*) is measured for 61 economies by the Bank of International Settlement (BIS). Nominal EERs are estimated as geometric weighted averages of bilateral exchange rates. The trade weights are based on manufacturing exports. In turn, Real EERs are the same weighted averages of bilateral exchange rates but are in turn adjusted by relative consumer prices. The following formula is used with  $l = 1, 2 \dots N$  being the trading partners of country  $i$ :

$$REER_j = \sum_{l=1}^N \text{Trade weights}_{j1l} \times \text{Real exchange rate}_{j1l} \tag{2}$$

**Table 3**  
**Control variables, sources, period and expected signs for econometric regressions**

Variables	Source	Period	Expected sign
<b>Unit labor cost</b>	UNIDO Industrial Statistics Database	1995 to 2010	-
<b>Product market regulation</b>	OECD Product Market Regulation Database	1998 to 2013	-
<b>Real effective exchange rate</b>	Bank of International Settlement Statistics	1995 to 2011	-
<b>Cost to export</b>	World Bank Doing Business	2004 to 2011	-
<b>Size of manufacturing sector</b>	OECD Trade in Value Added (TIVA) database	1995 to 2011	+
<b>Foreign direct investment</b>	UNCTAD Interactive database	1995 to 2011	+

Source: Authors on the basis of literature review and the data websites: UNIDO data on wages, value added and employment to calculate unit labor cost: [www.unido.org/resources/statistics/statistical-databases.html](http://www.unido.org/resources/statistics/statistical-databases.html); OECD data on Product Market Regulation: <http://www.oecd.org/eco/growth/indicatorsofproductmarketregulationhomepage.htm>; World Bank data on cost to export: [www.doingbusiness.org](http://www.doingbusiness.org); BIS Real effective exchange rates: [www.bis.org/statistics/eer.htm](http://www.bis.org/statistics/eer.htm); and UNCTAD Foreign direct investment: <http://unctadstat.unctad.org/EN/>.

The following variables are of specific interest for the effect of intermediate services on competitiveness. These

- Total domestic service value added contents as % gross exports;
- Specific domestic cost and value services value added contents as % gross exports;
- Total foreign service value added contents as % gross exports;
- Specific domestic cost and value services value added contents as % gross exports

The model was estimated using generalized methods of moments (GMM) with one time lag of the outcome variable. The GMM has several advantages. The GMM can be used when the distribution of the data may not be known. GMM does not require distributional assumptions for the variable of interest. A dynamic GMM estimation also circumvents the bias associated including a lagged dependent variable as a regressor (uncorrelated to error or fixed effects) and allows to calculate consistent and efficient estimates. The GMM estimation also allows dealing with omitted variable bias and simultaneity bias. Additionally, the panel data provides a richer set of information to exploit the relationship between the dependent and independent variables, reduces collinearity among the explanatory variables, increases the degrees of freedom, and gives more variability and efficiency.

The model was estimated for 61 countries and 16 manufacturing industries for the years 1995, 2000, 2005, 2008, 2009 and 2011. The countries include high-income ones and emerging economies, mainly from Asia and Latin America. All variables are normalized, so the coefficients can be interpreted as elasticities. The

model was first tested including only control variables (Table 4). A model is estimated using a two-step GMM approach. Sargan/Hansen tests are applied for overidentifying restrictions for all specifications, as well as the Arellano Bond test for first and second order correlation. Moreover, a number of covariates are endogenized (PMR, cost to exports, REER and manufacturing size). In addition, a fixed-effects model is tested for each specification to test the robustness of results.

The results suggest that changes in the global export market share of sector  $i$  in country  $j$  at year  $t$  are positively associated to last year's export market share. Product market regulation has an expected negative and significant sign only when regressed with the other control variables. The unit labour costs, defined as wages per employee over labour productivity, are found to be positively correlated to countries' export market share. This surprising result may be arising from the fact that that higher cost may be associated with higher quality products and market shares. Another possible explanation is that a lack of data on wages and labour productivity may distort this result. Cost to exports emerges as a highly significant (and negative) covariate of the global export market share. This result coincides with the literature, suggesting that increasing costs are detrimental for service-exporting countries.

The stock of FDI-to-GDP, a proxy measure of the presence of foreign technology within a country, suggests that FDI is surprisingly negatively linked to higher export shares. A high FDI intensity may reflect the fact that countries with a high intensity already have high global manufacturing export market shares, making it difficult to further increase these shares. Ideally a more disaggregated measure of FDI intensity, at the manufacturing level, could give more robust results. The Real Effective Exchange Rate (REER) is negatively related to the global export market share for countries in the sample as expected. Exchange rate fluctuations and the exchange rate misalignment are considered to have a significant effect on economic growth and export performance (Rodrik, 2008). Countries with undervalued exchange rates grow faster, as a result of production shifts towards tradables, which tend to have higher productivity growth rates. Results suggest that an appreciation of the REER (increase) could negatively impact on the global export market share. Finally, the manufacturing size is included to control for the size effect on global export market shares, but turns out not be significant.

**Table 4**  
**Control variables to explain changes in global manufacturing export market shares, 1995 to 2011**

		Global market share change ( $\Delta Q_{ijt}$ )					
Previous period market share	$Q_{ijt-1}$	0.118*** (0.0175)	0.119*** (0.0186)	0.111*** (0.0156)	0.118*** (0.0186)	0.112*** (0.0186)	0.105*** (0.0187)
Product market regulation	PMR		-0.0730 (0.0634)		-0.0977 (0.0636)	-0.0873 (0.0633)	-0.130** (0.00630)
Cost to export	Cost				-0.422*** (0.102)	-0.421*** (0.101)	-0.308*** (0.115)
Unit labor cost	ULC			0.0432* (0.0255)		0.0571* (0.0310)	0.0806*** (0.0309)
FDI stock as share of GDP	FDI						-0.0984** (0.0429)
Real effective exchange rate	REER						-0.413*** (0.0750)
Manufacturing size	Manuf						-0.000163 (0.0342)
Constant		0.0411*** (0.0162)	0.00571*** (0.0228)	0.0352*** (0.0127)	0.0623*** (0.0228)	0.0607*** (0.0227)	0.118*** (0.0237)
Observations		2,352	2,064	3,040	2,064	2,064	2,016
Number of geosectors		640	560	816	560	560	560

Notes: Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$

Source: Authors on the basis of econometric regressions.

Table 5 presents results when including in the model's two main variables of interest, namely the domestic and foreign value added of total and business services in the export performance measure (global export market share): renting machinery and equipment, research and development and computing and related activities. The model includes all control variables considered in the baseline regressions. These results suggest that total domestic services content is negatively associated with global exports market shares and total imported services positively. However, when the focus is exclusively on business services the results change: the domestic value added of renting machinery and equipment and research and development are positively associated to a higher global export market share for the average country. In contrast, the effect of imported (foreign) business services in the equation seems less clear: imported renting and machinery services have a positive effect on the export performance measure, while imported computed and related services have a significant (and negative) effect. As a robustness check, regressions were performed with the differentiated global export market shares and differentiated explanatory variables. Results go in line with those from level-variables.

**Table 5**  
**Additional variables explaining changes in global manufacturing export market shares, 1995 to 2011**

	Global market share change ( $\Delta Q_{ijt}$ )	Global market share change ( $\Delta Q_{iit}$ )
Previous period market share	0.0982*** (0.0186)	0.115*** (0.0196)
Total domestic services contents	-0.355** (0.162)	
Total imported services contents	0.600*** (0.192)	
Domestic contents of renting of machinery and equipment		0.488*** (0.121)
Domestic contents of computing and related activities		-0.0901 (0.154)
Domestic contents of R&D and other business services		0.613*** (0.242)
Imported contents of renting of machinery and equipment		0.152*** (0.0776)
Imported contents of computing and related activities		-1.020 (0.290)
Imported contents of R&D and other business services		0.0550 (0.268)
Constant	0.214*** (0.0359)	0.0934*** (0.0334)
Observations	2,016	2,016
Number of geosectors	560	560

Notes: Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

Source: Authors on the basis of econometric regressions.

To further explain the result of a negative contribution of the total domestic contents of manufacturing exports to changes in global export market shares, on the one hand, and a positive contribution of some individual types of domestic business services, on the other, separate regressions are performed using the control variables and specific types of domestic services (see Table 6).



These regressions illustrate that while some services (renting of machinery and equipment, R&D and business services, education) contribute positively, other services (hotels and restaurants, finance, real estate and health and social work) seem negatively associated with changes in global market shares. In sum, individual services seem to have different impacts on global market shares.

Whereas changes in the global export market shares have already been used in the literature as a measure of export performance, other export performance measures are also explored to capture the role of domestic and foreign services in exports. One of the alternative indicators is the EXPY indicator, which uses the methodology by Hausman et al. (2007) to estimate the level of technological sophistication embodied in a country's export portfolio. Regressions with the same control variables and service-related variables suggest that the effects are not as clear as when considering global export market shares.

## 7 Conclusions

This paper focuses on indirectly traded services through their incorporation in manufacturing exports. It shows that the Latin America does not underperform in terms of the incorporation of intermediate services in their exports of manufacturing goods, when compared to developing countries and regions in Asia. This finding seems to reject a common thought that the region's stagnant export performance in goods trade over the past fifteen years could be due to the insufficient incorporation of intermediate services in exports. Comparing Latin America with ASEAN, it turns out that the domestic services value added intensity of manufacturing exports is higher in the former, whereas the imported services value added intensity is higher in the latter. This could be due to the fact that ASEAN countries are more integrated in global value chains, which are more intensive in imported services. Another possible explanation is different trade specializations: ASEAN countries export relatively more labor-intensive and technology-intensive manufactures that are more services intensive, compared to Latin America which is more specialized in natural resource-intensive industries.

Regressions seems to suggest that total domestic services content of manufacturing exports are negatively associated to global exports market shares, whereas total imported services are positively associated. However, some types of domestic business services are positively associated to changes global export market shares, while domestic finance and real estate services may be negatively associated.

These results can be further developed to the extent more data become available, which cover more countries and recent years. An on-going ECLAC project is building an almost full regional input-output table for recent years. Better data could help with econometrics to better understand differences between Latin American and Asian countries in terms of the intensity of different types of domestic and imported intermediate services. Factors that need to be studied more are types of specialization in natural resource, labor or technology intensive industries, forward and backward participation in global value chains, product and service markets restrictions, domestic presence of foreign firms in service sectors, and participation in free trade agreements. This work also opens up avenues for future research on the impact of different domestic and imported service intensities on manufacturing export performance. This requires linking these service intensities to performance measures of domestic service sectors. Moreover, this work could be extended to primary goods producing sectors. Finally, other definitions of export performance can be tested, as well as the differential contributions of different types of services.

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## MANAGING VALUE PROPOSITIONS IN SERVICE ECOSYSTEMS

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### **Abstract**

*The role of value propositions has been stressed as a key element of service ecosystem formation in the context of innovating. To extend the understanding of value propositions, this empirical paper explores the perceived value propositions from business actors in a service ecosystem and how these value propositions transform over the process of joining a service ecosystem. This paper uses an explorative single case study approach with a longitudinal perspective, and it shows that perceived value propositions change during the process of joining a service ecosystem. Subsequently, four stages of value proposition transformation have been identified - (I) discovery, (II) initiation, (III) contract, (IV) partner.*

## 1. Introduction

Value propositions are considered to play a key role of a company's success and business strategy and scholars see value propositions as "the essence of strategy and the firm's single most important organizing principle" (Payne and Frow, 2014, p. 213). Further, value propositions represent the core strategy and leverage the competitive advantage of a firm (Lehmann and Winer, 2008; Collis and Rukstad, 2008). The term value proposition is embedded in our everyday language and is not strategically thought through and articulated in business at all instances. Frow and Payne (2012) asked over 200 companies and found that many organizations use the term in their everyday language, less than 10% of them formally communicate, develop and use value propositions. Value propositions are, according to service-dominant logic and the current understanding of value co-creation in service ecosystems (Vargo and Lusch, 2004, 2015; Prahalad and Ramaswamy, 2004), no more to be seen as offerings put forward by a single entity in dyadic relationships, but as co-created offerings for all actors in service ecosystems (Kohtamäki and Rajala, 2016). Practice shows that it is increasingly difficult to offer a single intended value proposition, which engages all actors in the service ecosystem in co-creation activities. The diversity in the individual actors' perception about offered value propositions leads to difficulties in managing value propositions within service ecosystems (Frow et al., 2014). Considering that value propositions are a key driver for engagement in business activities, managing them in the context of a service ecosystem is seen as crucial for the success and survival of a service ecosystem (Ballantyne et al., 2011).

The collaboration between a multitude of interconnected individuals, customers, partners, competitors, and suppliers is increasingly common (Mele et al., 2010). Organizations are shifting their strategy, focus, and capabilities from firm centricity to a system perspective, to exploit value created by all actors in the system (e.g. Van der Borgh et al., 2012; Van Haverbeke et al., 2016). Furthermore, research on ecosystems has concentrated on how actors organize themselves into systems around new developments, technologies, and ideas (e.g. Thomas and Autio, 2014; Ritala et al., 2013). To further study this upcoming field of research, new theoretical concepts and lenses are needed (Maglio et al., 2015; Maglio and Breidbach, 2014). The literature on service-dominant logic serves as a basis for further research due to their inherent system perspective and advanced understanding of value co-creation (Vargo and Lusch, 2016). Service-dominant logic refers to these networks of value co-creation among different actors as service ecosystems (Thomas, L. D. W., & Autio, E. (2014). The processes of ecosystem emergence. Working Paper, Imperial College Business School, University of London, July).

Bridging the field of value propositions and service ecosystems, one crucial question that is still rather untapped relates to how a service ecosystem perspective changes the way value propositions need to be managed and what role they play in the evolution of a service ecosystem (Frow et al., 2014). The paper thereby aims to provide empirical background on value propositions in service ecosystems and seeks to answer the research question:

*What are the perceived value propositions of a service ecosystem and how do these form over the process of an actor joining a service ecosystem?*

## 2. Theoretical Background

### 2.1. Service Ecosystems

Ecosystems, as a concept, have been used to describe the increasing emphasis on the interdependency and co-evolution of individual actors (Autio and Thomas, 2013), such as suppliers, customers, governments, and universities in systems going beyond networks. A seminal contribution to the literature on ecosystems in the business and innovation context was made by James Moore (1993), who adopted the biological metaphor of the “ecosystem” to describe how organizations and individuals interact and evolve in systems that operate very similarly to those that we can observe in nature. The key insights, which were later developed by other authors, were built on the systemic nature of ecosystems, including the principles of shared environment, co-evolution, interdependence, and ecosystem leadership (e.g. Moore, 1993; Iansiti and Levien, 2004). Recently, the scope of the term “ecosystem” in scholarly research has expanded significantly, including concepts such as platform ecosystems (e.g. Thomas et al., 2014), technology ecosystems (e.g. Wareham et al., 2014), and service ecosystems (e.g. Akaka et al., 2013).

Service ecosystems, from the theoretical perspective of service-dominant logic, are defined as a relatively self-contained, self-adjusting system of actors connecting through shared norms and service exchange (Vargo and Akaka, 2012). Service-dominant logic provides a foundation to characterize service ecosystems as systems of multiple actors in institutional contexts that interact directly and indirectly through value propositions and service exchange to co-create value. The routine and adaptive interactions among actors are guided by institutions, which play a key role in the functioning of service ecosystems (Edvardsson et al., 2014; Vargo and Lusch, 2016).

Conceptualizations of service ecosystems are manifold and still seeking a mutual understanding about mechanisms, interrelations and even about fundamental parts of service ecosystems (Taillard, 2016; Corsaro, 2014; Akaka et al., 2013). A service ecosystem perspective brings new insights into the understanding of value propositions by focusing on multiple actors and their value co-creation interactions (Lusch and Vargo, 2014), highlighting the importance of interdependences, adaptation, and evolution (Frow et al., 2014). Service ecosystem perspectives contrast with the traditional focus on dyadic relationships between customers and service providers by emphasizing many-to-many interactions between multiple stakeholders (Gummesson, 2007). Thus, in service ecosystems, value co-creation is influenced by actors' ability to access, adapt, and integrate resources, which is deeply shaped by the social context (Akaka et al., 2013; Edvardsson et al., 2011; Pinho et al., 2014). From a service ecosystem perspective, value co-creation goes beyond the firm and customer dyad to a broader context where all participants (companies, customers, suppliers, employees, and other network partners) contribute to creating value for themselves and for others (Vargo et al., 2008).

In service ecosystems, value can be defined as an improvement in system well-being and can be measured in terms of system adaptability (Vargo et al., 2008; Payne et al., 2008). The interactions between actors offer opportunities to facilitate value co-creation for and with each other. Thereby, the quality of interaction including influencing elements such as trust or power among actors is essential to value co-creation

(Grönroos, 2008; Fyrberg and Jürriado, 2009. Researchers agree that a dynamic approach to studying ecosystems is needed to understand their learning, adapting, and evolving properties (Lusch and Vargo, 2014; Lusch and Nambisan, 2015; Taillard et al., 2016).

## 2.2. Value proposition

Value propositions are seen as having a key role for the co-creation of value within service ecosystems and are therefore an important instrument of guiding and motivating actors to engage with each other in a service ecosystem (Taillard et al., 2016). A supplier, for instance, is more likely to integrate own resources into a service ecosystem when other actors of this ecosystem are of potential future value for this actor. A potential partner of a service ecosystem would also be more willing to join or be an ambassador of such a service ecosystem the higher the provided value by its entity or its co-creating actors is (Vargo and Lusch, 2015). It can therefore be understood that value propositions in service ecosystems are a co-created offering by a variety of actors; no more a dyadic offering at the end of a value delivery chain by one supplier, but co-created networked value provided for the service ecosystems' actors. Hence, reciprocal value propositions in service ecosystems are not referred to as "suppliers" of a value proposition; because one actor in a service ecosystem cannot offer value propositions on its own, but are a co-created offering by a variety of different actors (Frow and Payne, 2011; Frow et al., 2014).

Value propositions as a concept are defined as a promise of value to customers that combines benefits and price (Payne and Frow, 2014). In Payne and Frow's perception, a successful value proposition design provides the means to achieve differentiation and to form the foundation for the ongoing supplier - customer relationships. Literature has discussed VPs from a variety of standpoints and through different theoretical lenses, ranging from a monadic understanding of value propositions, towards a multi actor understanding of value propositions (Anderson et al., 2006; Lanning 2003; Morris et al., 2005; Lindgardt et al., 2009; Voepel et al., 2004; Ballantyne et al., 2011; Frow et al., 2014). A recent shift in literature supports viewing value propositions as an offering put forward and influenced not only by a single supplier but by an overarching service ecosystem; this multi-perspective view changes the way value propositions may be managed (Frow and Payne, 2011; Frow et al., 2014; Vargo and Lusch, 2015).

In the context of this paper value propositions are seen as an offering put forward by co-creation of different actors situated in a service-ecosystem. Creating a value proposition is thereby not necessarily an active task, but can also be passively co-created by being part of the service-ecosystem (Frow et al., 2014).

A thorough design of communicated value propositions subsequently enables the formation of a successful service ecosystem (Frow et al., 2014; Ballantyne et al., 2011; Vargo and Lusch, 2015), because value propositions are the main reason for business actors to engage in co-creative activities and therefore pave the way for future collaborative innovations in the service ecosystem.

Yet, research focusing on the value propositions of service ecosystems can seldom be found and insight into value proposition from an outside perspective still needs empirical evidence (Frow et al., 2014). This is why this paper seeks to take a closer

look on service ecosystem development and the role VPs are playing in the process of actors joining a service ecosystem. It seeks to answer the following research question:

*What are the perceived value propositions of a service ecosystem and how do they transform over the process of joining a service ecosystem?*

### 3. Methodology

Given the lack of prior empirical contributions that create and establish a profound understanding of value propositions formation during a service ecosystem's development, the present study uses an abductive case study approach to explore the present research question (Dubois and Gadde, 2002). Such an open approach allows the understanding of perceptions and experiences in their real-life context (Miles et al., 2013). An explorative in-depth case study approach with a longitudinal perspective is implemented to better understand the perceived value propositions and how they transform over time (Eisenhardt, 1989).

The case selection is based on the purpose a) to research a service ecosystem in an immature state, b) to find a service system with a business model which engages multiple actors into co-creative activities, c) to explore an ecosystem with a high number of different actors engaging in co-creation, d) they have the possibility to approach the relevant actors. These selection criteria led to the choice of the case JOSEPHS<sup>®</sup>, an open innovation laboratory for the development and testing of innovations. The overall aim of this actor in a local service ecosystem for innovation is to provide an intermediary platform for companies and users to actively engage in co-creative and collaborative innovation.

JOSEPHS<sup>®</sup> enables co-creation of new services and products, with innovating companies assigning for a co-creation project with the intermediary. This includes a three-month tenure during which visitors of an open shop layout experience new product and service ideas and are encouraged to give feedback. JOSEPHS<sup>®</sup> further hosts events and workshops, located in its "Denkfabrik" (Think Tank). This way, JOSEPHS<sup>®</sup> builds and bridges engagement not only between customers and companies, but also between companies and other stakeholders within its emerging service ecosystem. Since the founding approximately two and a half years ago, JOSEPHS<sup>®</sup> has hosted over 600 events, leading approximately 30,100 co-creators and 72 companies in innovation projects.

JOSEPHS<sup>®</sup> in the context of this study is seen as a platform that provides value co-creation and creates access to a larger service ecosystem. This platform enables the actors of the service ecosystem to engage in co-creative value co-creation beyond the boundaries of JOSEPHS<sup>®</sup>. Given this large amount of value co-creation and the inherent need for all groups of actors to participate in order to achieve results, this service ecosystem can be seen as an extreme case, to be analysed on a micro (actor) level (Eisenhardt, 2007).

#### Data collection

Data collection builds on primary and secondary data from three different sources: (1) 14 in-depth interviews with representatives from individual company, (2) a full day

workshop with three company representatives, in which the value proposition of JOSEPHS<sup>®</sup> were the primary focus point and (3) participant observations during the formation phase of JOSEPHS<sup>®</sup>. Business actors from companies of different sizes (international corporations to local SMEs) were involved in the interviews, in order to provide a broad empirical basis. To enhance the balance of and to neutralize the uncertainties of influencing factors, actors from different industry sectors and in different geographical locations were interviewed (Eisenhardt and Graebner, 2007). Table 1 lists all interviewees, their position and organization.

Interviews with JOSEPHS <sup>®</sup> clients		
06/2014	Start-Up A	CEO
06/2014	Start-Up B	CEO
10/2014	Start-Up C	CEO
11/2014	Start-Up D	CEO
11/2014	Agency A	CEO
04/2015	SME Tech A	CEO
04/2015	Start-Up E	CEO
06/2015	Association A	Project Manager
07/2015	Company A	Project Manager
08/2015	Company B	Project Manager
09/2015	Start-Up F	CEO
12/2015	Company C	Project Owner
05/2016	Company D	CEO
06/2016	Start-Up G	CEO
Workshop with CEO's of JOSEPHS <sup>®</sup> clients		
02/2016	SME Tech A; Start-Up B; Corporation A	

Table 1: Overview of primary data collection

For the company interviews, a semi-structured interview guideline was implemented, to allow both room for flexibility as well as the opportunity to adapt the direction of the interviews. If certain topics appeared to be of specific interest, additional questions were asked in their directions (Swanborn, 2010). Interviews lasted 30 minutes in average and were recorded during November 2014 and December 2016.

Conducting the interviews over time allowed not only to tap into the knowledge which customers gained over time, but also to explore if and how value propositions change during service ecosystem development over time. This is why interviews were held with business actors starting from the early stages of the service ecosystem development. The selection of interviewees includes the first five customers and more recent customers. Due to the continual development of value propositions and the thereafter changing results over time, the interviews were spread evenly across first customers of this service ecosystem. Using a classic saturation process, the need for interviews stopped after the fourteenth at which point no new themes had emerged (e.g. Lincoln and Guba, 1985).

Following an engaged scholarship approach (van de Ven, 2007), in order to capture the best possible holistic perception of value propositions, primary data was further gathered through observations of formal and informal weekly meetings of JOSEPHS<sup>®</sup> staff, conducted over a 24 month period. Alongside meetings and workshops, the authors were provided access to background information including among others

tenure agreements between companies and JOSEPHS<sup>®</sup>, information regarding the details of the first interactions, and project reports. This additional material enables the evaluation of data and helps to validate the findings in context (Creswell, 2012).

### Data analysis

The presented primary and secondary data was transcribed and coded in a two step approach, in order to identify instances of value propositions. 1) The first step of coding was directed towards identifying general descriptions of value propositions during the process of service ecosystem formation. The basis for identifying the perceived value propositions is the framework adapted from Frow et al. (2014), displayed in table 3. Especially for further empirical research different value propositions were categorized. As this paper’s emphases is on the business actor perspective of value propositions, factors that apply in this context are:

Value Propositions	
performance of the product or service	received status for the business actor when joining a service ecosystem
information or intellectual property sharing	recommendations or introductions of other actors that enhance the value proposition
shared marketing	training on new aspects
feel-good of the business actor	fast responses
choice of different or similar service	security

Table 3: Value Propositions for business actors adapted from Frow et al., (2014)

2) The second step of coding used the identified value propositions and coded them in regard to when they appear during the process of joining the ecosystem. Following this approach, a thorough understanding of value propositions both in breadth and in depth was achieved. This comparative analysis of data (e.g., Bryman and Bell, 2015) was implemented by the use of a peer evaluation processes following Miles and Huberman (1994).

The different data sources ranging from observations, interviews and workshops allow an enhancement of the validity by triangulation. The resulting “network of information” enables the understanding and the meaning of language in context (Creswell, 2012; King and Horrocks, 2010). Following the suggestions of Swanborn (2010), the findings are presented by summarizing the data and providing transparency through the use of quotations (Patton, 2007).

## 4. Findings

Taking a deeper look into the perceived value propositions and how they transform during the process of joining an emerging service ecosystem, it became apparent from the analyzed case data that a) a number of value propositions such as innovating, shared marketing, reputation enhancement, received amount of feedback, knowledge sharing and networking can be identified and b) the perception of value propositions transform in four different stages. The first stage is the *discovery stage*, in which actors first see the service ecosystem. The second stage is the *initiation stage*, in which the outside actor engages with JOSEPHS<sup>®</sup> staff for the first time. The



third stage is the *contract stage*, in which an official contract has been signed and the three month tenure starts. The last stage is the *partner stage*, in which the contract has ended, but the actor is still co-creating with the service ecosystem.

#### 4.1. Perceived value propositions

The empirical data shows that business actors of JOSEPHS<sup>®</sup>, perceive a variety of different value propositions before, during and after the three month tenure. Aligning these value propositions with the adapted value proposition from Frow et al. (2014) and inductively researching new value propositions, a total of six value propositions have been identified:

(1) “Innovating” is perceived as a key value proposition. This context specific value proposition is considered to be of high importance and was primarily communicated during the interviews. This value proposition is very dependent on each individual company or offering. From the engagement with JOSEPHS<sup>®</sup> and its service ecosystem, business actors seek to gain ideas on how to improve their offerings or on directions for innovation. This perceived value proposition was referred to as the trigger to initiate contact with the service ecosystem and therefore plays an important role during the discovery of the service ecosystem.

*“But that was, for example, what we found good, that it is the possibility to get direct feedback” (Company C)*

*“We wanted to join JOSEPHS<sup>®</sup> because we want to further innovate our service” (Company A)*

(2) “Shared marketing”: Shared marketing is primarily used in terms of social media marketing by sharing and liking various social media posts and promoting the new companies on the website, in the present case context. In return, the business actors promote JOSEPHS<sup>®</sup> and other actors of the service ecosystem on their channels and co-create reciprocal value propositions. Former project partners, i.e. business actor “alumni” of JOSEPHS are still actively engaging after their three month engagement with the platform and are using this value proposition of the service ecosystem to e.g. promote events held at JOSEPHS<sup>®</sup>.

*“We identified people beforehand and brought them into JOSEPHS<sup>®</sup> to show them our product. We therefore also created a win-win for JOSEPHS<sup>®</sup> because they met people from JOSEPHS<sup>®</sup> and so on” (Start-Up C)*

*“It was not only to say, ok we want to test our software but it was more focused in the area of marketing, for example, lobby-work, to show our style at JOSEPHS<sup>®</sup>” (Company B)*

(3) “Reputation enhancement” is identified as a relevant VP for the situation when a company wants to join the studied service ecosystem because of the well-known actors within the service ecosystem. This value proposition is especially interesting for start-ups due to their need to validate new offerings with potential future users. Within the researched service ecosystem, this value proposition is easy to grasp for outside business actors since the project partner Fraunhofer, a German research institute, is understood to be highly valued and accordingly regarded as having the potential for enhancing the reputation for the associated service ecosystem actors. During the

data analysis, it also became apparent that Start-Ups perceive this value proposition as very attractive because they are unknown; a well-established brand (e.g. Fraunhofer) helps them to convince investors or give guidance and security to their future clients and customers.

*"It helps us in any case when we are connected with the JOSEPHS®. It is a reputable company, which helps us a lot" (Start-Up A)*

*"We saw Fraunhofer or JOSEPHS® as a brand that can help us to convince customers about our new ideas, because from Fraunhofer you have high expectations" (Start-Up E)*

(4) "Received amount of feedback"; The case data shows, that this VP states that business actors seek to measure the received service, often this is primarily needed to validate the expenditure of money and to compare other services or products. In this case, the amount of feedback is often seen as a number of questionnaires or co-created feedback. At JOSEPHS®, business actors report about wanting these facts, in order to make the co-created value measurable. Further, the received amount of feedback also provides a method to analyze whether or not the value propositions fulfil what has been offered beforehand.

*"So for us it was important that many people come to give us feedback. If we get 100 people, then it is not worth it. In the meantime, we are beyond 100, and that is certainly a measure, which we can use." (Association A)*

*"Mr. W. spoke about 700 to 800 people who gave qualified feedback and I would say for an innovation which largely represents the meaning of the whole is that of course, a very attractive feedback" (Company A)*

(5) The VP "knowledge sharing" describes the mutual learning in the service ecosystem, referring especially to areas of knowledge new to the service ecosystem actor. It has been reported that business actors are making use of the platforms knowledge about the implementation of design thinking workshops or that they use the access to this specific expertise for the planning of future, internal design thinking workshops. Company B for instance used and is still using the learnings about innovation tools for workshops in their own company:

*"I also learned some things. What helped me was the workshops with ED and energy companies... we would also not have been able to do it by ourselves" (Company B)*

*"During the time at JOSEPHS®, we learned a lot, not only about the research question, but about other areas as well." (Start-Up A)*

(6) "Networking" is a VP often explicitly expected by the interviewed business actors of the service ecosystem, and provides access to other actors in the service ecosystem. *Networking* has been reported as a as a relevant value proposition by all actors accessed in this case study. Thereby, networking also goes beyond the boundaries of JOSEPHS® and interconnects various actors in the the extended service ecosystem; an example is Start-Up C which got in contact with the city of Nuremberg:

*"Through JOSEPHS® we were able to gain a whole city as a partner; the city of Erlangen. This is just exciting "(Start-Up C)*

*"We did not expect that we would meet other business actors for potential future work" (Start-Up C*

## 4.2. Transformation of value propositions

During the interview process it became clear that value propositions transform through various stages; dependent upon the business actor and how deeply emerged he is in the service ecosystem. For instance, the expected value propositions before engagement with JOSEPHS<sup>®</sup> were much lower than the received value after the three-month tenure. This is due to the fact that not all value propositions were perceived at the beginning. The business actors perceived the value propositions at the beginning from an outside perspective and could not tell what value propositions exist beyond a certain line of visibility. Everything that lays behind this wall of visibility is unknown to the business actor and can therefore not be perceived as a value proposition.

The following quote sheds light on the "black box" of value proposition in emerging service ecosystems:

*"Let's put it this way, at the beginning I really did not know what I would get. This made it hard for me to get the budget through. I got it through only due to my persuasion. Because I just said to myself, that I believe in the service and I make sure that I receive good results."  
Company A*

The uncertainty of expected results plays an especially important role during the formation of the researched service ecosystem. As commented by *Company A*, customers have no prior experiences from which to rely on. Hence making involvement with the service ecosystem a risky venture with company resources. This lack of prior experience makes it difficult to transfer value propositions. Therefore, inducing a sense of skepticism as to the actor's intended returned value.

The *discovery stage* is the first stage which was identified during the data evaluation. It describes the process of identifying JOSEPHS<sup>®</sup> and analyzing whether or not the perceived value propositions fit the requirements to engage in future work.

First, contact and an understanding of the potential co-created value has to be established before engaging in any form of business relationship. Meaning: that the perceived value propositions must match with certain criteria of the business actor to engage in subsequent interactions (figure 2). During the *discovery stage* the actor perceived only a very small part of the value propositions, the entirety of the service ecosystem is still unknown to him. In this case, the value propositions (1) innovating, (2) shared marketing and (3) reputation enhancement, were the only value propositions that were identified by outside actors. The value propositions at this stage are not co-created with the business actor, they are merely an offering by JOSEPHS<sup>®</sup>.

*"I really did not expect that JOSEPHS<sup>®</sup> would bring us in contact with other companies, to me it was only a way to ask customers about our service" Start-Up D*

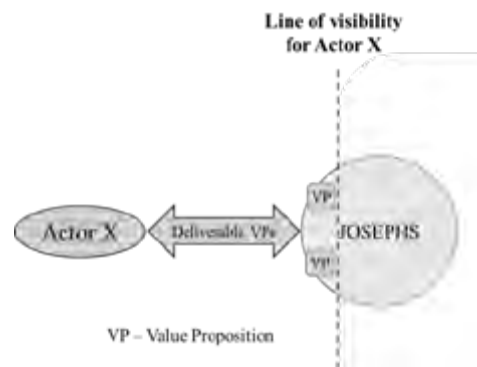


Figure 2: Discovery stage

During this *discovery stage* (figure 2), potential business actors cannot see behind the line of visibility and can therefore only rely on the perceived value propositions that are inherent in the provided outside perspective of the organization. The creation of value propositions during this stage is not realized co-creatively due to the customers' absence of contact with the organization. If value propositions proposed at the *discovery stage* meet the company's criteria, actor X starts the *initiation stage*.

Having confirmed that JOSEPHS® will meet the company's criteria, actors enter the *initiation stage*. At this point actors are convinced of the potential value to be gained and hence get in contact with actors at JOSEPHS®. During this stage, value propositions are co-created with Actor X and are individualized depending on the needs of each actor.

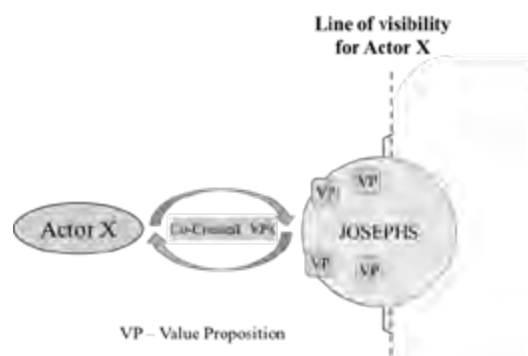


Figure 3: Initiation stage

Before signing the contract and starting a business partnership, the *initiation stage* further displays value propositions for Actor X. These value propositions are either already known to the actor or new to the actor (see figure 3). Factors that have been identified during this stage are: (1) innovating, (2) shared marketing, (3) reputation enhancement, (4) Received amount of feedback and (5) knowledge sharing - which has not been mentioned prior to the *initiation stage*. In the case of JOSEPHS® this stage is used to co-create the value propositions with actor X, by evaluating individualized solutions for each actor in meetings before the three month tenure starts.

The *contract stage* is the stage in which the business actor experiences the service for the first time. Therefore, exploration takes place as the business actor examines

the extent to which the promised value propositions can be fulfilled. Further, the business actor experiences additional value propositions through discovery and exploration of the unknown service ecosystem that lies behind JOSEPHS<sup>®</sup>. At this time business actors receive the normal value propositions which are provided by JOSEPHS<sup>®</sup>. These value propositions are very similar to the value propositions which are postulated during the *initiation stage*. However, it is at this stage that actors for the first time have access to the value propositions offered beyond the direct influence of the platform and hence are able to use the value propositions of the whole service ecosystem in the background. Actor X is therefore able to see what other service ecosystem actors offer as value propositions and is therefore able to perceive more value propositions.

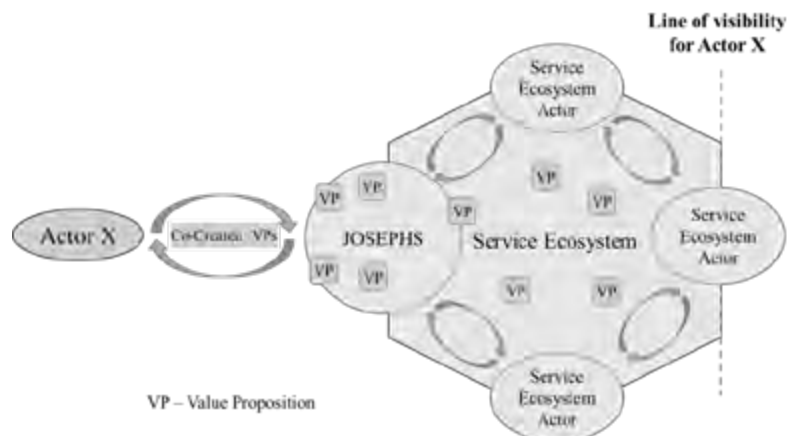


Figure 4: Contract stage

During the *contract stage*, Actor X is able to perceive all value propositions made accessible by JOSEPHS<sup>®</sup> and by the service ecosystem (see figure 4). After the contract ends, most actors leave the service ecosystem. However some do remain over the timespan of the contract for future value co-creation with JOSEPHS<sup>®</sup> or other actors from the service ecosystem. In the case of JOSEPHS<sup>®</sup>, Start-Up C was able to get in contact with the city of Nuremberg and is still in contact with them. Another example is Start-Up B, who were able to get in contact with a large sports shop chain. Both companies were able to get into contact with actors from the service ecosystem through the JOSEPHS<sup>®</sup>

Following on from the three-month tenure, Actor X is no longer contractually obligated to JOSEPHS<sup>®</sup>. However, due to the returned value from the service ecosystem in the previous stages, it becomes clear that future work with the service ecosystem offers effective means of value co-creation and that Actor X will therefore stay within the service ecosystem (see figure 5). During the *partner stage* only service ecosystem specific value propositions are used. In this case, it is (2) shared marketing, (3) reputation enhancement and (6) networking. In this case, Actor X can also engage with other actors from outside of the service ecosystem by offering them certain value propositions. In doing so, he brings new actors closer to the service ecosystem and enables the engagement of resource integrating actors for the service ecosystem. In the case of JOSEPHS<sup>®</sup> this is realized by having joint events with former business actors. One external actors for instance, joined JOSEPHS<sup>®</sup> for a three

month tenure and has since then permanently brought in new business actors for new innovation projects.

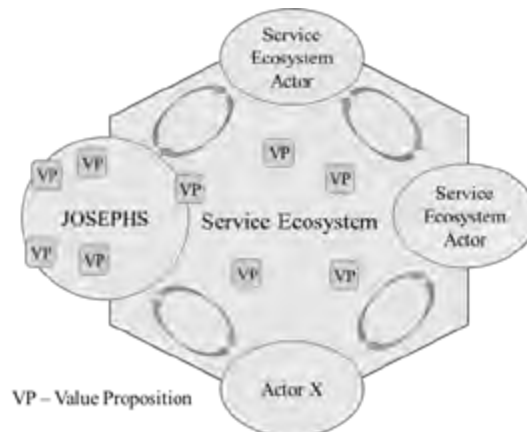


Figure 5: Partner stage

It is important to note that only a small part of actors would go this route and stay in close relationship with the service ecosystem. This is primarily determined by the fact that every service ecosystem provides very different value propositions and the value of these propositions is highly depended on the independent actor.

After stating that different value propositions are perceived and that they transform in different stages, the value propositions are mapped according to the stage they appear in (see table 3). It is shown that the *discovery stage* as well as the *partner stage* both are only working with a very limited amount of perceived value propositions and that especially the *contract stage* offers all available value propositions to the business actors.

Discovery Stage	Initiation Stage	Contract Stage	Partner Stage
(1) Innovating	(1) Innovating	(1) Innovating	(2) Shared marketing
(2) Shared marketing	(2) Shared marketing	(2) Shared marketing	(3) Reputation enhancement
(3) Reputation enhancement	(3) Reputation enhancement	(3) Reputation enhancement	(6) Networking
	(4) Received amount of feedback	(4) Received amount of feedback	
	(5) Knowledge sharing	(5) Knowledge sharing	
		(6) Networking	

Table 3: Value propositions perceived at different stages

## 5. Discussion

This study was designed to provide better insight into perceived value propositions, when joining a service ecosystem. Referring to scholarly work on value propositions this case study can support the discourse by e.g. Frow et al., (2014) with empirical

evidence. From the present data of a service ecosystem for the co-creation of innovation. Some differences and additions could be identified.

(1) Innovating – is a context specific value proposition, which is only present in this case study. Nevertheless it is important to understand the own key value propositions a company offers. This value proposition is innovating in the context of JOSEPHS® other business models would offer a very different value proposition here. The case shows that innovating is a value proposition that is the most important during the *discovery stage*. It is however very important to not just focus on the delivery of just this value proposition, because a company would consider this their main value proposition. Since business actors are already perceiving this value proposition when they are in contact, with JOSEPHS® the focus on the other value propositions is of high relevance to keep people in the service ecosystem. It can therefore be said that innovating is a good value proposition to initially engage people and to start the *initiation stage*, it is however mandatory to pursue the other value propositions as they are the ones that keep the business actor engaged in the service ecosystem.

The first value proposition that has been analyzed is (4) received amount of feedback. Literature discusses it under the term “performance” (Frow et al., 2014). However, performance only partially covers the findings from this case study, because performance does not totally match with the specific requirement to prove that a value proposition will deliver the desired performance. In order to offer a value proposition, a platform can only offer a certain amount of feedback, which might then be understood as performance by the beneficiary. This argument is amplified by the fourth axiom of SDL in which “value is always uniquely and phenomenologically determined by the beneficiary” (Vargo and Lusch, 2016).” This means that a platform can only assume the value proposition for the business actors. However, the business actor has to determine by himself, which value proposition offers the best value for him. (3) Reputation enhancement, is described as an intangible resource that is often shared in service ecosystems (Hillebrand et al., 2015). “Reputation enhancement, experimentation, and relationship motives, are the most salient and recurrent triggers to co-create” in a service ecosystem (Pera et al., 2016, p. 4). Frow et al. (2014) describe the term as “received status”. This case study supports the existence as Frow et al. (2014) show. Reputation enhancement is foremost perceived by companies who are not well known and was therefore highlighted by SME’s referring to something like “label” which could be used to increase the trust in the company for venture capital or customers. (2) Shared marketing, another value proposition from the case data, has recently been discussed in literature and is described as a short term function in collaborative undertakings (Pesämaa et al., 2013). This case study shows that shared marketing may not be restricted to short term functions and that it can be used during long-term service ecosystem partnerships as strong value propositions to co-create value in the service ecosystem (Frow et al., 2014). This is clearly shown from the example that the term “shared marketing” has previously been discussed as a value proposition in academia and can with this case study be supported with empirical evidence. (5) Knowledge sharing, has been broadly researched in a variety of literature strands and especially in inter-organizational innovation it is seen as a mandatory need, and problem at the same time (Bogers, 2011). “Knowledge sharing” has primarily been researched in terms of or “knowledge transfer mechanisms among users, suppliers, and manufacturers” with the goal to “out-innovate networks with less effective knowledge-sharing” mechanisms (Dyer and Nobeoka, 2000, p. 346). The need to grasp the importance from a value proposition perspective is still yet to be understood completely. “Knowledge sharing” has already been seen as a value

proposition in academia and the empirical approach of this case study can support the previous theoretical work from Frow et al., (2014). (6) Networking has been previously discussed in the context of value co-creation and is often seen as important factor for effective service ecosystems (Thornton et al., 2013). Networking is a fundamental premises for collaboration in service ecosystems and therefore broadly researched (Ramaswamy, 2010). This single case study was able to identifies, on the basis of previous research, that networking is a perceived value proposition with a high degree of importance for business actors. The literature on value-proposition has, to the author's knowledge, not identified it yet as a value propositions for outside actors of the service ecosystem.

Beyond the previously discussed perceived value propositions, this paper was also able to identified four stage of value proposition transformation. During the *discovery stage*, value propositions are seen as deliverable promises and are not co-created with the outside actors. Following Porter (1985) and several other researches (e.g. Mahoney and Pandian 1992; Hughes and Chafin, 1996; Maklan and Knox, 1997), the creation during this stage is highly similar to the "classic" approach of value propositions development, which is seen as a deliverable promise from supplier to customer. Even though value propositions literature often refers to the essential need of co-creation of value propositions, it is simply not possible to co-create with actors who are just observing a company's value propositions from the outside. Co-creation of value propositions can therefore only take place if the actors know each other and can interact (Bower and Garda, 1985; Lanning, 1998; Porter, 1985).

The *initiation stage* is seen as a process of co-creation of value propositions from a dyadic perspective. The dyadic creation of value propositions is well research by a variety of different authors (e.g. Glaser 2006; Ballantyne and Varey 2006; Vargo and Lusch, 2004; Kowalkowski et al., 2012). In addition to the co-creative nature of value propositions, they are also reciprocal, which says that participants during the value creating process "recognize that their objectives are complementary rather than antagonistic, and carry this idea into negotiation, the value outcomes for all parties are likely to be enhanced" (Glaser, 2006, p. 446)

As value is determined by the beneficiary (Vargo and Lusch, 2015) the business actor is able to identify whether or not there is a use for the different actors which are part of the service ecosystem. The value propositions go therefore beyond the direct influence of JOSEPHS® and are indirectly co-created by other actors from the service ecosystem (Frow and Payne, 2011; Yu and Yih, 2014; Frow et al., 2014; Vargo and Lusch, 2015). Value propositions are therefore for the first time, offered by the service ecosystem and a reciprocal understanding of value creation in service ecosystems is realized (Glaser. 2006).

During the *partner stage*, value propositions are still co-created by the service ecosystem (Frow and Payne, 2011; Frow et al., 2014; Vargo and Lusch, 2015). The difference however is that actors only take the service ecosystem value propositions and do not received value propositions from the engagement platform anymore. Actor X can, in turn, also be considered as an engagement platform itself due to them being "a multi-sided intermediary that actors leverage to engage with other actors to integrate resources (Storbacka et al., 2016, p. 8)."



## 6. Conclusion

Overall, this case study analyses value propositions in service ecosystems and how they transform during the process of joining a service ecosystem. This longitudinal case study reveals that actors within this case study are not perceiving all value propositions that can be offered by the service ecosystem. They can only see the surface of value propositions. The more business actors are engaged with a respective service ecosystem, the more value propositions will be possible to perceive and can therefore be taken up by the outside actors. The paper shows that value propositions within this case study can be categorized into six different value propositions. It validates and adds to the work of Frow et al., (2014), some value propositions could be validated while others were not found and can therefore be added to the existing body of literature. Beyond the validation of existing value propositions in service ecosystems and the addition of new value propositions, this paper also mapped the identified value propositions along its appearance for external actors and is therefore able to identify four distinct stages of value proposition transformation. Analyzing these stages, it became clear that value propositions are not either only offered by the supplier (Bower and Garda, 1985; Lanning, 1998; Porter, 1985), nor always reciprocally co-created by the service ecosystem (Frow and Payne, 2011; Frow et al., 2014; Vargo and Lusch, 2015). Furthermore, the findings from this single case study show that the creation of value propositions is highly depended on the respective stage the actor is currently in. The *discovery stage* for instance, does not allow the co-creation of value propositions, where in contrast the *contract stage* enables co-creation of value propositions with the engagement platform and with the service ecosystem. This transformation of value propositions enables a new perspective on how to design and how to offer value propositions.

## 7. Implications for theory and management

The present study contributes to a better understanding of value propositions and how they are perceived and transformed when joining a service ecosystem, especially in B2B settings. While empirical studies of value propositions have often focused on either a dyadic understanding of value propositions, this study leverages the understanding of value propositions from an ecosystem perspective. Theoretical implications that can be drawn from this study are that a value proposition does not have to be co-created at all stages with the outside actor. Especially before joining service ecosystems, it is often not possible to engage actors from the outside into the process of value co-creation and therefore the value proposition during the *discovery stage* is primarily an offering from actor A to actor B (Bower and Garda, 1985; Lanning, 1998; Porter, 1985). Further, value propositions from an ecosystem perspective do not always apply, especially during the *initiation stage* it became clear that the offered value is only co-creative and reciprocal (Glaser 2006; Ballantyne and Varey 2006). Value propositions during this stage are not at a service ecosystem level as value is determined by the beneficiary, and one actor cannot determine the potential value or what parts of a service ecosystem are valuable for a certain actor. Actors therefore need access to the ecosystem in order to receive value propositions from it (Vargo and Lusch, 2015). It is shown that the overall possible value propositions of a service ecosystem and its actors cannot be determined from an outside perspective.

Managerial implications are that it is of high importance to create reciprocal value propositions in the initial stages of service ecosystems formation. In practice, this translates into the involvement of potential business actors in the service innovation process to create platforms that engage actors into service ecosystems. Second this leads to an inclusion of the initial actors into the creation of value propositions which helps dramatically in understanding the value propositions from an actor perspective. The identified value propositions of service ecosystems enable managers to analyze each value proposition individually and it offers insights into the design and the improvement of these value propositions. The stages allow an in depth understanding of when these value propositions are perceived and how each stage should be managed. The case study highlights that especially during the early stages of service ecosystem formation, it is paramount to display and communicate the value propositions clearly to enable insights and access to the “perceived black box” of a service ecosystem.

In this case study, the value proposition of JOSEPHS® is co-creation as a service for companies. This value proposition is displayed and seen on the website or other marketing channels. However, it is difficult for potential business partners to understand the potential of co-created value propositions without further access to the platform or the service ecosystem. The importance of displaying as many value propositions during the early stages is therefore key as they are seen as an entry point for joining a service ecosystem. During this *initiation stage* outside actors do not grasp the full potential of the service ecosystem or do not even perceived the service ecosystem beyond the orchestrating actor they are in contact with.

## 8. Limitations and future research

Although the results of a single case study cannot be generalized, further research in different scenarios would serve both to validate these findings as well as to extend the understanding of service ecosystems and their components. A limitation of this paper is, that only a particular incomplete group of actors within the case study could be interviewed and not all actors.

Further research on this topic would no doubt yield fruitful results, should engage in looking at different industries and different constellations of business actors. It could henceforth be postulated if the factors identified in this paper apply to a differing engagement platform, or if a different service ecosystem would require an entirely new set of factors.

Beyond these generic avenues of future research, it is also of interest to investigate value propositions in service ecosystems from a customer perspective rather than in a B2B context. Deeper insights into the design and creation of value propositions in ecosystems might be especially interesting for practitioners.

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# MANIFESTATION OF INTENT IN PRODUCT-SERVICE SYSTEMS: A STUDY OF TYPE OF SENSING IN COLLABORATIVE ROBOTS

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*Scholars in the product-service system (PSS) field of study have acknowledged a gap in theoretical frameworks and survey methodologies that can direct scholars and practitioners towards cohesive future methodologies. This study works with the assumption that an underlying cohesive thread in PSSs is the human element of Intent. Taking an applied linguistics methodological approach in the study of Type of Sensing and Intent, this study illustrates how Intent can provide an integral way of studying PSSs. The examples are taken from the study of the development of collaborative robot (CR) PSSs. Founded in data from CR PSSs, the method and findings act as an illustration as to how applied linguistics might contribute as research method to a deeper understanding of the study and conceptualisation of a PSS.*

## 1. Introduction

The business model development of a traditional manufacturing company from product focused to that of an integrated product-service offering has broadly been termed 'servitization' in services and technology management research (Cavalieri & Pezzotta, 2012; Baines *et al.*, 2007; Vandermerwe & Rada, 1988). The idea of shifting from products to services was introduced already in the 1960s by Becker (1962), who together with other scholars within the same decade, had proposed the rise of services economy where people would not only purchase / consume products but the intangible benefits surrounding product consumption (Levitt, 1969; Fuchs, 1965, 1968). With advancing automation technologies confluencing with that of the developments of information communication technologies (ICTs) in the past decades, the intangibles surrounding product consumption has come into greater focus, both in business models and in academic literature. Today's customers not only acquire products, rather they acquire solutions to challenges they face in their tasks. This solution package has mostly been referred to as a product-service system (PSS) (Tukker & Tischner, 2006a, 2006b). As a means for how to research/study a PSS that encompasses complex processes pegged at different levels of hierarchy, a working definition of a PSS was proposed in a 1999 report commissioned by the Dutch ministries of Environment (VROM) and Economic Affairs (EZ) as:

"...a marketable set of products and services capable of jointly fulfilling a user's need. The PS system is provided by either a single company or by an alliance of companies. It can enclose products (or just one) plus additional services. It can enclose a service plus an additional product. And product and service can be

equally important for the function fulfilment. The researcher's need and aim determine the level of hierarchy, system boundaries and the system element's relations." (Goedkoop, van Halen, te Riele & Rommens, 1999:18).

As technology advances and converges in function, a more modularised customer centric approach can now be taken when it comes to product-service offerings that at the same time allows for manufacturing companies to remain competitive by differentiating themselves on the market (Gebauer, Gustafsson & Witell, 2011). The composite character of a PSS as connecting product-technology with social-technical systems, have seen several ontological and epistemological studies addressed by various scholars (Beuren, Gomes Ferreira & Cauchick Miguel, 2013; Baines *et al.*, 2007; Goedkoop *et al.*, 1999). Although not always having positive environmental impact (Tukker & Tischner, 2006a), for some scholars, a PSS contains an element of environmental symbiosis and sustainability, defined by either life cycle management strategies or lower environmental impact of manufacturing systems (Kjaer, Pagoropoulos, Schmidt & Mcalooone, 2016; Manzini & Vezolli, 2003; Goedkoop *et al.*, 1999).

Taking cue from academic journal publications, PSS as concept and framework seems currently salient as a topic of research at the intersections of the disciplines of Business Management (that includes Business Service and Decision Science), Engineering and Environmental Science (Annarelli, Battistella & Nonino, 2016). The past decade's scholastic literature also indicate that the PSS concept has largely been investigated from the tripartite perspective of (A) product-oriented PSS, (B) use-oriented PSS and (C) result-oriented PSS (Annarelli *et al.*, 2016; Sakao, Ölundh Sandström & Matzen, 2009; Baines *et al.*, 2007; Goedkoop *et al.*, 1999). What seems lacking in the field of PSS research, acknowledged by scholars are theoretical frameworks and survey methodologies that can direct scholars and practitioners towards a cohesive future methodologies framework of analysis and investigation (Tukker & Tischner, 2006a, 2006b). Scholars have also found that studies on PSS are often exploratory in nature, employing a quantitative (survey) method of inquiry, else describing and analysing via the use of case studies. In particular, practical applications and theory testing of characterised PSS within the academic literature needs to be done, which can be challenging for the study of PSS whose applicability can cross different fields (Annarelli *et al.*, 2016).

### **1.1. Study focus: The human factor of Intent in product service systems**

Yet within this fragmentation and perceived lacking of theoretical and methodological coherence in the study of PSS lies the human factor of Intent, as reflected in language use in the discourse of the processes surrounding a PSS. This contribution views Intent, defined as 'aim or purpose' to be the coherent element that runs through the tri-partite conceptualisation of the PSS. Intent could be said to be reflected implicitly in the PSS literature, the purpose of this study is to make that element explicit in illustration that the tripartite characterisation of PSS is interrelated and construes the experience of a PSS as indeterminate and fluid.

Intent is often put forth in language in use, whether in negotiations on designing or implementing a PSS. Intent in the processes of the PSS could be seen as containing multiple nuances, being one of the primary motivators of producing, using and developing a PSS. It is a human factor element that is present in the tripartite perspective of the PSS, in addition to being present in the larger contextual environment of the ecology of the PSS, the uncovering of which is done via an analysis on the discourse surrounding the processes of the PSS.

This contribution proposes that uncovering Intent behind the conceptualisation, production and use of a PSS can help scholars and practitioners towards a more holistic understanding of the processes of PSS development. The main research questions addressed in this contribution are:

- How can Intent, currently reflected implicitly in the tripartite characterisation of a PSS be made explicit in illustration as a core element of coherence in a PSS?
- How can Intent in PSSs be used to complement current state-of-art understanding of its development processes?

Taking on a systems theory perspective in international business studies and organization science, this contribution leverages the findings of studies on PSS conceptualisation and framework (Annarelli *et al.*, 2016; Geum, Lee, Kang & Park, 2011; Baines *et al.*, 2007; Goedkoop *et al.*, 1999), and complements data to the field via primary and secondary data. The purpose of this study is to conceptualise and model an integral perspective of the PSS framework, in complement to the general tripartite PSS framework currently reflected in the literature, the binding element of coherence being Intent. The integral model proposed aims at illustrating that the complex processes reflected in a PSS can be investigated in a systematic systemic manner, towards a holistic perspective and understanding of the processes and development of a PSS. The PSS study example is collaborative robots, used for various applications and purposes across industrial sectors from electronics, healthcare, food and beverage and entertainment.

The method of data analysis is an applied linguistics framework based on systemic functional linguistics (SFL) unto the retrieved and transcribed videos of recorded interviews. A concordance software, AntConc, is used to facilitate accurate data mining and analytics in the created corpus. The concordance results are then analysed using SFL's transitivity analysis framework, in particular, Type of Sensing in mental transitivity processes in order to uncover Intent. The applied linguistics method is further exemplified in the sections below.

## 2. Literature review

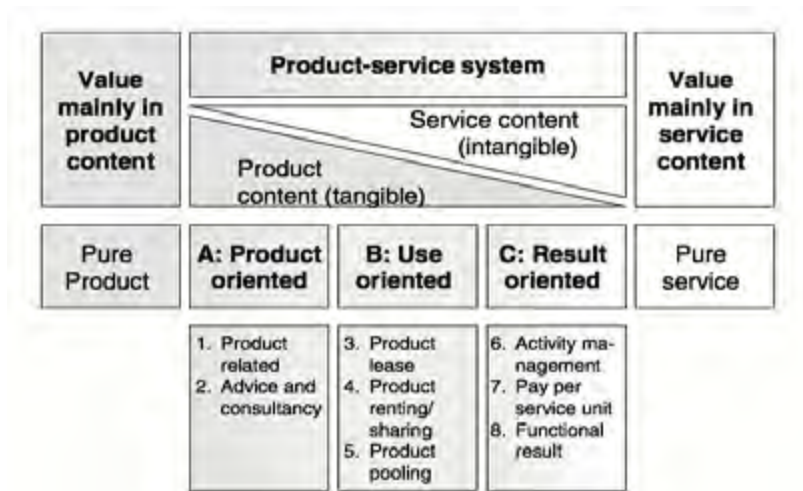
### 2.1. Conceptualisation of the product-service system

Since its initial conception in 1999 by Goedkoop *et al.*, product-service system (PSS) characterisation and conceptualisation by Tukker (2004) could be said to be one of the most widely cited (in 367 articles) and cross-referenced frameworks used in the PSS studies (Annarelli *et al.*, 2016; Barquet, de Oliveria, Amigo, Cunha & Rozenfeld, 2013; Geum *et al.*, 2011). The main and subcategories that comprise a PSS as represented by Tukker (2004) is reflected in Figure 1.

While scholars tend to agree that the division of products and services remains undefined and perhaps context specific, the characterisation of PSS types fall (that in turn affect how PSSs are researched) broadly under:

- i. Product oriented services. In this PSS type, providers focus on the sales of the product and offer advice and consultancy services in relation to the product sold. The consultancy services provides a value-add for the customer. An example of is of a product introduced into a factory line and the provider gives advice on how to optimise the logistics and supply chain management (SCM) of the new product as part of the production unit. This system leverages on the existing infrastructure and organizational structures in order to position the sales of the product, elaborating on current business systems (Tukker & Tischner, 2006a).





**Figure 1.** Main and subcategories of a product service system (PSS), as represented by Tukker (2004: 248).

ii. Use oriented services. In this PSS type, the product is leased and the provider retains ownership of the product, often responsible for the maintenance, control and repair of the product through its life-cycle. Services under this system include renting, sharing or product pooling. These types of services can also bolster elaboration of business systems, the value-add sometimes occurring in the manner in which the product is available through leasing rather than direct purchase and ownership.

iii. Result oriented services. In this PSS type, the customer's needs are in focus in the manner of attention paid by the provider towards customisation of product. This could involve the provider, working closely with the customer, to conceptualise a novel solution needed to the current business system.

## 2.2. Sustainability as core element in a product-service system

Apart from the fragmented nature of the applications of the PSS that places a challenge on gaining a holistic, integrated view of PSS as a research stream, current literature also reflects intensive discussions within the academic circles on the element of sustainability in a PSS (Boons and Lüdeke-Freund, 2013; Tukker 2006a, 2006b; Goedkoop *et al.*, 1999). Some scholars go farther to define the implementation of a PSS as having a lower environmental impact than traditional business models based on the understanding that system based solutions facilitate a different infrastructure due to product-service design and network relations (Allen Hu, Chen, Hsu, Wang & Wu, 2012; Mont, 2002). The implementation of eco-efficient PSSs is widely bolstered by national and regional funding agencies such as research projects within the field of PSS and sustainability funded by the European Union (EU) under its Factories of the Future (FoF) PSS cluster projects (EU 2017). Despite the knowledge accumulated, there seems a consistent find that the design and implementation of the concept remains limited much due to that in most cases, such PSSs fall within the realm of 'radical innovations' that challenge existing physical and social infrastructures, coming to bear upon individual belief systems, current organizational cultures, corporate regulations and even dated digital infrastructures that hinder efficient operations (Ceschin, 2013; Vezzoli, Ceschin, Diehl & Kohtala, 2012; Tukker & Tischner, 2006a; Mont, 2002)

As a note on the use of words in concept definition, 'sustainability' in this contribution is understood as implying a certain autopoiesis of a system, wherein the system is able to sustain

itself through a continuous dialogic of its internal processes (aligning its inherent potential towards future continued adoption and development) and external processes (being part of an ecology of systems). The use of the term here as such, has broader meaning implications than measurable variables of eco-PSSs.

### **2.3. Collaborative robots**

Robots and automata have captured the creativities and espoused the inspirations of human beings since antiquity. Yet it was really in the past decades from about the 1950s onwards, spurred with the works of authors such as Robert Heinlein and Isaac Asimov (1950), that robots gained popularity. Reports by the International Federation of Robotics (IFR, 2016a, 2016b, 2016c) suggest a continued increase in robot installations across functions, across international markets. Although China is the largest robot market since 2013 with a continued dynamic growth, 2015 IFR statistics indicated that Europe seems to currently hold the highest robot density per 10,000 persons employed with 92 units, compared with 86 in the Americas and 57 in Asia (IFR, 2016c). With the average global robot density at 69 units, the low density of robots for Asia could possibly be attributed to the overall differentiated developed economies of Asia. Japan and the Republic of Korea for example, are some of the more globally advanced countries in manufacture and use of robotics.

Collaborative robots (CRs) are a type of industrial robot designed to work alongside humans in a shared workspace (Probst, Frideres, Pederson & Caputi, 2015). This is currently a new frontier in industrial robotics because of the way in which CR redefines industrial robotics, division of labour and human-robot working spaces. In terms of products and services in the CR industry, Europe seems to take lead with Danish Universal Robots (UR) launching their CR range in 2009. The duo-armed YuMi by ABB, a European founded multinational enterprise (MNE) with 250,000 robots installed globally, was launched in April 2015 at the Hannover Fair, having first been conceived in 2007 within the organization (Bogue, 2016).

### **2.4. Collaborative robots product-service system**

Due to that CRs are meant to operate in the same workspace as humans without safety cage barriers, the standards of safety features of CRs are highly regulated and strict. Most CRs are built in accordance to the International Organization for Standardization (ISO) safety standards that could be either national or regional specific, the ISO/TS 15066:2016 for example, that specifies safety requirements for collaborative industrial robots in supplement to ISO 10218-1 and ISO 10218-2 (ISO, 2016).

The congruent collaboration between public governmental and academic institutions, with private organizations makes the processes around a collaborative robot product-service system (CR PSS) an interesting example for an integral conceptualising of a PSS via the study of Intent that underlies a PSS. CR also allows for mass customisation from industrial robotics in a way that could not previously have been done in manufacturing processes. Being user-friendly and human oriented in design, some CR being equipped with facial expressions (e.g. Baxter and Sawyer, Rethink Robotics) and duo-arms (YuMi, ABB), it brings robotic technology to new market segments such as small to medium enterprises (SMEs). Due to its dexterity at being repurposed towards a different function, CRs can also cross from pure manufacturing functions to the entertainment (DJ YuMI, ABB) and food industries (barista robot, Bubble Lab). As such, the cross-function, highly customisable CR can be seen as operating in a PSS.

### 3. Method

#### 3.1. Empirical data collection

CRs are fairly novel in technology, the first being launched in 2008 by Danish UR (Business Wire, 2016). They also form a particular segment of automation products in total, which makes obtaining direct information from companies difficult. Table 1 shows the figures for the top eight robotics companies worldwide, known as the Big-8, based on number of installations (Trobe, 2016; Montaqim, 2015). Considering the qualitative methodology adopted for this study, as well as the novelty of the study of Intent in the PSS being investigated, it was more effective to retrieve secondary empirical data for analysis and insight into the CR PSS.

Fanuc	400,000
Yaskawa	300,000
ABB	250,000
Kawasaki	110,000
Nachi	100,000
Kuka	80,000
Denso	80,000
Epson	45,000
Adept	25,000

**Table 1 (left).** Top international robot companies, the Big-8\*, based on robots installed worldwide (Trobe, 2016). \*These numbers do not specifically reflect collaborative robots installed. UR's fast growing CR sales and statistics for example remains unreflected in the Big-8 figures.

In order to retrieve the data, a keyword search for “collaborative robots” in YouTube was used. The keyword search had a retrieval rate of over 97,000 results. The plethora of genres of CR related videos range from documentaries, installation and programming (instructional) videos, demonstration of new features of existing CR products, to company marketing material. In order not to conflate the purposeful production or Intent of the video production (i.e. for product marketing or for science education) with the Intent of a CR PSS, the results were further filtered to reflect Intent in a CR

PSS from a (i) producer perspective and (ii) customer/user perspective. The videos chosen for analysis will include a form of producer and customer/user narrative that in turn can be transcribed into texts for the purposes of analysis.

#### 3.2. Management of retrieved data

With current digital technologies and online platforms for information sharing, the more likely scenario in today's research context is that scholars and practitioners are faced with an overwhelming amount of data to be retrieved and systematically managed for analysis. Videos accessible for public viewing in this sense provide a rich source of data to be retrieved and studied.

In order to study the CR PSS, 20 corporate videos uploaded unto shared media platforms such as YouTube were selected to form a small corpus for text analysis. The videos retrieved were produced mostly by top CR producing and installing companies (the Big-8) such as Universal Robots, Fanuc, Yaskawa, ABB and Rethink Robotics. Each video was transcribed using modified standard orthography (MSO), following the Göteborg Transcription Standard (GTS) version 6.4 (Nivre, Allwood, grönqvist, Gunnarsson, Ahlsén, Vappula, Hagman, Larsson, Sofkova & Ottesjö, 2004). Each video was transcribed at three levels in accordance to MSO GTS version 6.4 (Nivre *et al.*, 2004):

- Ti. Text accompanying video upload
- Tii. Text appearing as subtitles or tags in the video and

Tiii. Text as transcription of interviews with individuals in the videos

In the case of studying a CR PSS in an integral manner, corporate videos were chosen as a source for data for the following reasons:

- (i) Consistency of purpose in the video production. Most videos retrieved were produced for the main purpose of show casing new models of CRs and their applications from the producer's perspective and/or show casing the implementation of CRs in factories from the integrator/customer/user perspective. The retrieved data were selected based on their illustration of these various perspectives of individual actors within a CR PSS.
- (ii) Concise information presentation. Most videos were concise, ranging between 3 to 5 minutes in length. The main purpose of which was to showcase interviews with individuals who had expert knowledge within the CR PSS either as producer, integrator or user of a CR. Gaining their perspective in terms of how they speak about CRs can in turn lend a multi-agent view of the CR PSS.
- (iii) International scope. The retrieved data span different countries of CR PSS applications. The spanning of perspectives retrieved from actors of different countries and geographic regions gives the possibility to explore country/region specific CR PSS development and ideologies of implementation.
- (iv) Multimodal source of data. Apart from the three levels of text analysis that these retrieved videos allow for, the dimension of visual analysis of paralinguistic features, spatial context etc. can also be carried out as complementary facets of analysis, thus enriching insight into findings.
- (v) Open access data. The open access data allows for similar types of data to be collected, and compared either in parallel studies or longitudinal studies. It also allows for a corpus database to be developed for specific purposes and types of studies that when taken in their entirety of perspectives, gives a comprehensive view of the field of research interest.

### 3.3. Use of concordance software

A corpus of texts was created with the MSO GTS transcriptions from the 20 videos retrieved. A concordance software, AntConc (Anthony & Baker, 2015a, 2015b), was used for data mining and analytics. In this sense, this study is corpus drive. AntConc is a freeware concordance program for Windows, Macintosh OS X and Linux. The software includes seven tools that allows for data mining and analytics to be carried out in the form of conducting word frequency listings, keyword-in-context searches, identifying both sequential and non-sequential patterns of use for a specific word (clusters/N-Grams, word collocates), searching for statistically significant similarities/differences between texts and corpora (concordance plots) and making multi-modal comparisons using corpus linguistics methods. On condition of a standard applied transcription, a concordance software analysis is replicable.

The concordance software in this study was used as a means to organize texts and to bring statistically significant data to foreground, such as the most frequent use of various types of verbs (adjunct, transitive, intransitive) that help identify Transitivity processes in the next stage of data analysis. AntConc was also used in its frequency word list, word collocation and concordance plot functions to help identify which transcribed texts had the highest concentration of use of specific words such as *with*, *can* and *are*, that depending on collocation and use in context, might illustrate Intent in both the design and implementation / use of a CR PSS. Texts with most relevant examples for Intent are used as Text Examples in this article.

### 3.4. Systemic functional linguistics: Transitivity analysis

Systemic functional linguistics (SFL) views language as a social semiotic, where language is a systemic resource/tool for meaning making in context. Developed by Michael Halliday (Halliday & Matthiessen, 2014; Halliday, 1978) who developed further the notion of language as a system from the works of Firth (1957), the central organizing dimension of SFL is that of foregrounding the paradigmatic axis of choice in the use of language when most standard grammatical frameworks would foreground the syntagmatic axis. The foregrounding of the paradigmatic axis allows for the analysis of a more comprehensive spectrum of language functions found within the language system, where actors, circumstance and processes can be specifically identified by cross analysing both paradigmatic and syntagmatic axes of lexical use and construct.

In order to study Intent in the CR PSS, the PSS is viewed mainly as dialogic occurrences between actors within the PSS such as producer, integrator, customer and end-user. The CR PSS whilst can at any instantaneous moment be described as having a set of elements that constitute a PSS, in general, a PSS is a living and evolving phenomenon that consists of processes, of flows of events and activities. Since processes are actor driven, Intent of action, of desirability could be seen as an underlying current of motivation for processes, whether ideological or material. A dimension of the multifunctional constructs of the clause is to convey and construe the processes of reality in various contexts. This is done simultaneously by three metafunctional lines of meaning that include the textual, interpersonal and experiential:

- (i) The *textual metafunction* presents in the broadest sense, the theme and rheme of the clause. It pertains to the overall message concerned and manages the flow/coherence of the discourse.
- (ii) The *interpersonal metafunction* presents the clause as proposition, whose meaning is interpreted consultatively with others. As such, clauses allow for interpersonal interaction, usually indicated in mood (subject + finite), modality (modal adjuncts) and polarity (positive/negative) constructs in discourse.
- (iii) The *experiential metafunction* presents how reality is experienced and interpreted. It conveys the quantum of change in the flow of events as a figure (actor/sensor/sayer) in relation to a configuration of processes (material, behavioural, mental, verbal, relational, existential) set in a certain context that unfolds over time.

The three metafunctions provide a broad outline of meaning that occurs in discourse simultaneously manifest in the Transitivity system of language in use. It is the study of processes that constitute the system of Transitivity analysis (Halliday, 1967/8), adopted here for the purposes of studying Intent in the CR PSS. Intent can be observed in the form of 'outer' and 'inner' processes. Outer and inner processes is most often cognitively perceived as intertwining, our experiences seem to fold unto each other as a single activity process through linear Time. What we experience as 'out there' often is related to how we feel 'inside'. Transitivity analysis in SFL however, through material process clauses (that of doing) and mental process clauses (that of sensing) has the capacity as tool, to disambiguate these intertwining processes as experienced through Time. Relational processes clauses that help identify and classify actors in contextual circumstances might also help distinguish outer and inner experiences that in this study help uncover Intent as an underlying element in a CR PSS.

The framework of Transitivity analysis in SFL is based on the London School tradition, developed by M.A.K. Halliday during the 1960s. Halliday's work is built on J.R.Firth's works on linguistics (Firth, 1957). SFL is a framework that reflects how the architecture of language can be used as an instrument of systematic analysis of meaning making in context (Halliday & Matthiessen, 2014; Halliday & Hasan, 1985; Halliday, 1978; Halliday & Hasan, 1976; Firth, 1957). There are two ways in which Intent in a PSS can be studied via textual analysis gained from the empirical data retrieved. The first is to view focus on the text as an object of

study in itself. In this instance, the text is studied for its meaning, why and how does it mean what it does to readers. Why would the text be valuable when studied in this context? The second means to study Intent in a PSS would be to focus on the text as an instrument of design, and what that can uncover about the motivation in developing the PSS as a whole.

In the case of a collaborative robot PSS for example, the producers (usually engineers) might often collaborate with customers (or future users of the product) in order to propose a CR solution. In this case, all design ideas and formulations are captured in dialogue/text between the producer and customer. So the language system (meta-linguistic properties in lexicogrammar) in this case becomes an instrument of product-service design in its facilitating and moulding capacity. The two means of studying Intent in a PSS are interrelated and will reflect of each other.

### 3.4.1. Transitivity analysis: Type of Sensing, mental processes and Intent

SFL can be seen as a linguistic toolbox containing various tools for specific purposes. In this study, the system of 'Type of Sensing' is used as analysis tool in order to uncover Intent in the CR PSS. Type of Sensing is usually conveyed through mental clauses in language, treated in grammatical analysis as four distinct types: *perceptive*, *cognitive*, *desirative* and *emotive*. Identified through verbs in mental clause constructs, the four types differ with respect to phenomenality, directionality, gradability, potentiality and ability to serve as metaphors of modality. This specific tool is chosen because CRs have been designed to be specifically human-friendly and human work environment oriented. As a product, it seems to appeal to the human senses, some CR products such as Baxter by Rethink Robots has a tablet that reflects eye expressions so that the robot can communicate its current state towards the user. A short example of Type of Sensing and Intent, illustrated in the use of mental clause constructs is shown in Text Example 1 (in underline).

### 3.4.2. Transitivity analysis: Material processes, processes of doing

The study of Type of Sensing and Intent as most often indicated by the use of mental processes in clause constructs is complemented by a study of material processes or processes of doing / happening. Material clauses construe events as a flow of quantum change, taking place by initiation of input from a source of energy. In the case of a CR PSS, this source of energy could be human or robot, the latter due to that human users of CRs tend to personify robots and give them agency of their own.

The following text example from a transcript in the corpus data to this study is a short example of material clauses. The text example appears in the manner of MSO GTS version 6.4 (Nivre *et. al.*, 2004). Although material clauses (in italics) are predominant, mental clauses (in underline) that express desire or Intent are also shown. In some clauses, mental and material processes follow each other (Text Example 1, line 1).

Text Example 1. Excerpt from transcript "220150624 Universal Robots Tegra Medical"

\$HB: now what we were hoping to find as a platform / that we *were scalable* / something that we *could take* internally that we *could do* all the engineering on the integration by ourselves without an outside resource or integrator / the collaborative class series robots have just come out when we started looking into it / and uhm / we really thought that was something beneficial because a lot of our operations we wanted to put together in mini cells and it's confined work spaces but operators *have to be able to interface* with the automation / so having big cages if it was a regular industrial robot would have / uh / wouldn't have been advantageous to what we *were trying to do*

### 3.4.3. Perspectives of Agents and Actors in a collaborative robot product-service system

Mental transitivity processes that help uncover Type of Sensing and Intent, and the manifestation of Intent in concrete material processes (processes of doing/happening) have agency and actors behind them. In Text Example 1, it is often “we” as agents in mental and material clauses. The “we” from Text Example 1 comes from a firm level perspective, a customer and end-user perspective to a collaborative robot produced by the Danish company, Universal Robots.

Agency and Actorship in the SFL framework can be studied in a systematic way through the Pronoun system of language in use. Most languages of the world have deictic words or directional pointer words that help interlocutors orientate their focus and perspective, illustrated in the use of “I/You”, “We/They”, “It” and “Its”. Having a deeper understanding of the actors behind the mental and material processes will help lend insight into the developmental or evolutionary trajectory of the CR PSS in general.

## 4. Findings and discussion

SFL’s transitivity analysis, exploring Type of Sensing is a means of exploring Intent and the Agency/Actorship behind the Intent. The following sections will help illustrate how Type of Sensing and Intent can be uncovered using transitivity analysis. The analysis is an illustration in answer to the first research question posed for this study:

- How can Intent, currently reflected implicitly in the tripartite characterisation of a PSS be made explicit in illustration as a core element of coherence in a PSS?

The concordance software was used as the initial means to manage the corpus data created for the purposes of studying a CR PSS. Not all features of the concordance software was used, and not all results will be discussed. Rather the feature most used from the concordance software to the relevance of the study are the *word frequency list* that shows which words appear most in the discourse of a CR PSS, the *concordance plot*, which indicates which transcript/s can be used as most relevant examples for the word in context study and the *concordance* itself, that indicates Agency/Actorship behind the transitivity processes, Type of Sensing and Intent. This is useful in identifying which perspective tends to drive a CR PSS development. The examples that appear in the sections below are meant as illustrations, and are not necessarily indicative of exhaustive results.

### 4.1. Concordance analysis

The transcribed data rendered a corpus of 2569 word types with 18136 tokens. Apart from determiners (*the, a*), prepositions (*to, of, in*) and content words that surround the semantic web of “collaborative robots” such as *robot, we, with, robots, collaborative, our* etc. that make the top 0.05% (top 130 word occurrences) of the corpus word frequency list, the most frequent word pertaining to Type of Sensing is the word “can”. The word “can” is a mental transitivity process indicating of the Type of Sensing that is *perceptive*. In terms of a CR PSS context, “can” is often used in relation to *potentiality* and *possibility* of innovation, of function etc. grounded in context of use through Time.

The concordance plot for the word “can” indicates which transcribed texts contain the most frequent use of the word in context. It indicates which texts could be further analysed and

shown as text examples in this article for the uncovering of Intent when studying a CR PPS. For the case of the word “can”, the best text examples would be Hit Files 5 (File: 20160121 Universal Robots five unique selling points, 15 hits), 6 (File: 20160229 Universal Robots Prysm Australia, 11 hits), 11 (File: 20161019 KUKA talks HRC trends at IMTS 2016, 10 hits) and 1 (File 20150413 YuMi Intro ABB Robotics, 10 hits). The remaining four texts outside of the screen capture had 8 or less hits per text.

There are 95 concordance hits for the word “can” in the corpus. The concordance program shows mostly agency in the transitivity analysis when “can” is used in material processes (processes of doing). About 28% (27 of 95 hits) of the concordance hits indicate a generic “you” as main Actor or Agent of material action in the processes.

The Actor or Agency of action as a generic “you” is indicative of the Type of Sensing and Intent that runs through the cline of the CR PSS. Whether viewed from the perspective of pure product (product orientation in design and production to use and then service orientation), where “can” also indicates potentiality of material processes to be carried out such as “you can program the robot”, “you can work right next to them”, “you can grab the arm” etc., it seems CRs as a product are designed, manufactured and programmed (where programming a CR is both user and service orientated in a PSS) to be producer-independent and more user-controlled for mid to long term use.

Other than material processes, the word “can” also occurs in relational processes. The use of the modal + verb “can be” in relational constructs point towards existential potential. Upon closer analysis of the collocates of “can be” that makes up 20% (19 of 95 hits) of the corpus results, shows that many examples are used in context of material processes or processes of doing, thus putting a heavy emphasis on how CR as a product continues to be purposed for user and service orientation. Some examples of clause constructs include, “collaborative robots can be readily equipped with”, “larger moves can be programmed”, “robot can be installed adjusted and put into production fast” etc.

## 4.2. Transitivity analysis

### 4.2.1. Type of Sensing, mental processes and Intent

Whilst few Type of Sensing words occur high up on the word frequency list of the corpus, following Halliday & Matthiessen (2014) framework of analysis for Type of Sensing, the mental process “want” was concordance searched using what is known as the wild card character, “\*” together with the root “wan”. The search term “wan\*” renders a string of search retrievals with variations of ending after *wan-* such as “wanted” and “wanting”. There is a total of 20 hits for the search term “wan\*”, with the word “want” (15 hits) occurring low on the word frequency list in the corpus, compared to the word “can” (95 hits). The word “want” is often used in context of a mental transitivity process, indicative of a *desirative* Type of Sensing and Intent. The other hits for the search term “wan\*” are for “wanted” (3 hits) and “wanting” (2 hits).

The concordance results for the search term “wan\*” uncovers the Agency / Actors in the transitivity process analysis, the main Agent and Actors of the mental processes being “we” that denote all perspectives from producer, integrator and customer/user of a CR. Even when negative polarity “no/not” is used in collocation with the word to produce “don’t want”, the Agency and Actorship belongs to “we”, the examples being:

- (i) Customer/user perspective “we want to change it immediate and don’t want to wait till an engineer is coming over”,
- (ii) Customer/user perspective, “we don’t want it to be dependent on an integrator” and



- (iii) Customer/user perspective, “we don’t want employees to feel that the robot is there to take their job away”

The Agency and Actorship that occurs with negative polarity in desirability reflects an inherent Intent of long-term viewership of product-processes. The aim is to become in the long run, autonomous from the manufacturer of the product in terms of being self-reliant on robot programming, the service orientation of which is seen as transferred from manufacturer to user of the product (reflected in examples (i) and (ii)). This long term view of independence, the development of autonomy from manufacturer and producer of product can be seen as an inherent strategy for sustainable business goals, keeping costs down in examples, and increasing in-house knowledge on management of new technology and technological processes. But sustainable business goals is illustrated not only in terms of user independence and development of own technological skills, it is also illustrated in terms of the Intent of developing an orientation towards human ergonomics, employee well-being and maximising human talent by taking away repetitive tasks (reflected in example (iii)).

The transitivity analysis findings for the search term “wan\*” illustrates that the fact that retrieved lexical items for “wan\*” occurs low on the word frequency list in the corpus does not in effect make it less interesting to study. Words such as “want”, “wanted” and “wanting” indicate desirative Intent in a CR PSS, where in this case, covers a range of long-term prospectivising (i.e. sustainability strategizing) of CR as a product, its use and its service orientation for future development of the product. In terms of the cline of product-service orientation, the mental process “want” suggests an evolving dialogic of a co-creative feedback loop from producer, to integrator and user/customer of the product.

The use of the high modal Type of Sensing “want” seems closely correlated to findings of the mental process high modality “need”. The corpus has 19 hits for the word “need” used in context. The majority of instances of “need” in the corpus pertains to the functional aspects of a CR from a customer/user perspective as a product. Examples of the word Type of Sensing “need” used in context include, “*need for safety*”, “*need to be flexible*”, “*need to be competitive*”, “*need to get high output*”. The use of the word “need” in the CR PSS context gives indication to the motivation of the design and manufacture of the CR as product, and how the product functions within its own eco-system, the CR PSS.

Another cognitive high modality word that indicates (strong) future expectations of what a CR PSS can deliver is contextualised in the use of the word “will”. “Will” occurs in low frequency through the corpus, with 32 hits in total. The results indicate that about 44% of the hits advocate main Agency and Actor for material processes used in combination with the high modal “will” to “the robot”, independent even of its producer or manufacturer. So once manufactured it is “the robot” that is seen by humans as the main enabler of activities in the workspace. This point of view is interesting because it uncovers a certain personification of a collaborative robot on the part of the human producers and users. The corpus findings seem to project the beginnings of an acceptance on the part of humans of a machine that humans can see as part of their eco-system. The high modal “will” also indicates a cognitive projection of perceived future expectation of a work scenario. 7 hits are followed by the relational verb “be” as example of perceived expected circumstance, such as “it *will be* the small part assembly application”, “yumi and humans *will be* working side by side” and “the robot *will be* even more useful”.

#### 4.2.2. Material process “to work”

While the transitivity analysis on Type of Sensing focuses primarily on mental processes, attribution of main Agency and Actorship in a CR PSS can help indicate its path of development or evolution. In looking at the highest occurring words in the corpus with regards to material transitivity processes, or processes of doing, the word “work” occurs at rank 52 of 2569 (top 0.02% of the list) word types, with its verb form “to work” having 14 hits. The context of situation with regards to the material process of working highlights the collaborative aspect of

a CR-human relationship, with the most common customer or user oriented collocates being “to work *with*” and “to work *alongside*”. The material process “to work” from product orientation in a CR PSS seems to emphasize safety features of a CR and ease of deployment of a CR, some examples being “*cageless, safe to work alongside humans*”, “*collaborative robot safe to work alongside humans*” and “*sawyer is safe to work with and easy to deploy*”.

### 4.3. Perspectives of Agency and Actorship in a collaborative robot product-service system

The inherent Intent and nature of a CR PSS as one designed to be collaborative and perceived as having future innovation potential, is predominantly illustrated in the corpus through the interpersonal and experiential metafunctions of language in use, reflected in the transitivity processes of Type of Sensing (mental processes) and doing (material processes). The transitivity analyses of various process types also indicate that the Agency and Actorship attributed within a CR PSS falls into the Pronoun system found in language of *I* (specific, 45 hits), *You* (generic, 108 hits), *We* (specific, 254 hits), *It* (product specific and system generic, 240 hits) and *Its* (product specific, 27 hits).

The Pronoun system in language in use, maps the various perspectives that reflect Type of Sensing and Intent within a CR PSS attributing Agency and Actorship (including personification of a robot as found in the corpus to this study) in various processes that occur in a CR PSS from manufacture of product to programming and deployment/use of product. These Pronoun system perspective can be mapped in an all encompassing four quadrants, reflected in Figure 2.



**Figure 2.** Agency and Actorship in a CR PSS mapped via the Pronoun system in language in use. The four quadrants show agency and actorship from intra/extra, singular subjective (“I”, “you” is implied), plural intersubjective (“We”, “you” is implied), singular objective (“It”) and plural interobjective (“Its” – systems view)

Because Type of Sensing and Intent are distinguished by different types of processes in the SFL framework, all Pronoun perspectives in their various forms, singular/plural, subjective/intersubjective, objective/interobjective, can encompass an “inner” and “outer” experience. These experiences whose meaning is reflected mostly in the interpersonal and experiential metafunctions of language is mapped through various transitivity processes, the inner experiences (intra) usually reflected by mental processes marked by verbs such as *think, like, want, wish* etc., and the outer experiences (extra) usually reflected (though not exclusively) by material processes such as *to assemble, to work, to run, to pick and place* etc.

In Figure 2, the Upper Left (UL) quadrant reflects the singular subjective perspective of “I”. This “I”, as with all other Pronoun perspectives can reflect inner and outer experiences labelled as “intra” and “extra”. These experiences are usually indicated in various transitivity processes through the use of verb forms in language. The perspective and Agency / Actorship of “I” can come from any individual acting within a CR PSS, from producer, integrator (technician/engineer) to customer/user. Their Type of Sensing portrayed and Intent within a CR PSS will depend upon their function or role within the CR PSS and their immediate concerns regarding the task at hand.

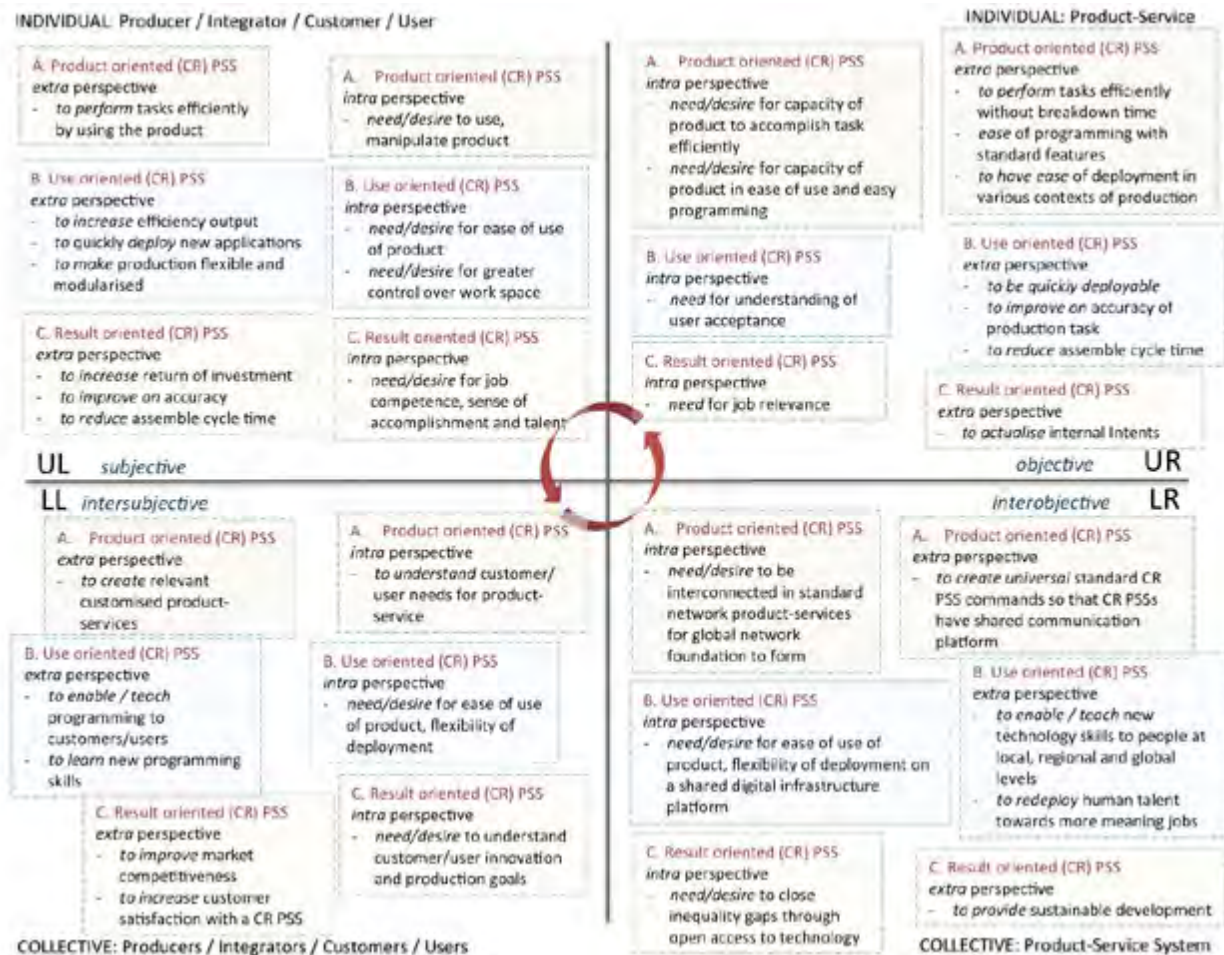
The Lower Left (LL) quadrant reflects the plural intersubjective perspective of “We”. This perspective is collective and due to (usually) corporate culture or proximity of working with each other, the inner and outer experiences tend to be collectively shared, with allowance given for internal variation of these shared experiences. So a producer of a CR as product, would and could in a CR PSS environment, collaborate with integrators as well as customers and users of the product in order to customise the product. These interpersonal and experiential metafunctions of “We”, intra-group or inter-group, are reflected through the various transitivity processes in language in use. The Type of Sensing and Intent as reflected in the UL and LL in a CR PSS most often materialises as a product-service that is reflected in the Upper Right (UR) and Lower Right (LR) quadrants. Just as one experiences reality as a fluidity of events and impressions between inner and outer experiences, the elements found in all four quadrants are interrelated. This is illustrated in Figure 3 at the centre of the four quadrants signalled by arrows drawn in circularity. The eco-context of the CR PSS provides the discorsal space between the perspectives that provide for constant negotiation and re-negotiation of Type of Sensing and Intent. The perspectives reflected in the UR and LR quadrants are the singular object “It”, reflecting a specific product-service such as a CR in the CR PSS, and plural interobjective “Its”, reflecting the system of product-services. The perspective reflected in the LR of Figure 3 could be described as the broadest, reflecting a systems (intra-system and extra/inter-systems) view of a CR PSS. Perhaps a distinct feature in the CR PSS grounded mapping of Agency and Actorship as reflected from the data in the study’s corpus is robots as personified. This personification of a collaborative robot where a robot is attributed Type of Sensing and Intent would be reflected mostly in the singular objective “It” perspective in the UR quadrant. As producers, integrators and users of a collaborative robot, humans project unto the machine, their own human interpretations and understanding of a robot’s experiences in its purposed function and context. The identification of Type of Sensing and Intent from a personified robot is also uncovered by the types of transitivity processes associated with it in language in use.

#### **4.4. Integrating Intent and perspectives of Agency and Actorship in a collaborative robot product-service system with archetypal product-service system models**

This section turns to address the second research question in this study:

- How can Intent in PSSs be used to complement current state-of-art understanding of its development processes?

Going back to the PSS literature on the conceptualisation of the PSS as conceived by Goedkoop *et al.* (1999) and in particular, Tukker's (2004) broader tripartite characterisation of (generic) PSSs from Pure Product to Pure Service, the Pronoun system perspectives that reveal Intent in a CR PSS can be placed alongside the conceptualisation of the PSS and its current applications in PSS research. The Agency and Actorship for the different types of PSSs, from (A) Product oriented, (B) Use oriented and (C) Result oriented PSSs are reflected in Figure 3.



**Figure 3.** Integrating findings of Intent as mapped by the Pronoun system of language in use with Tukker's (2004:248) conceptualisation of a PSS. The elements illustrated in the four quadrants appear as examples of lines of inquiry, and are not meant to be exhaustive.

Whilst the different orientation of PSSs A, B and C, produce variations in business models with eight archetypal resulting (Tukker, 2004), Figure 4 and its Pronoun system complements the (generic) PSS business models by uncovering Agency/Actorship behind the Intent for each type of PSS and its orientation. The examples of Intent for the various Pronoun perspectives is founded in a CR PSS, reflecting findings from the corpus data to this study.

What can be seen in Figure 4 is that Type of Sensing and Intent, that have behind them, Agents and Actors, underlie all orientation types of PSSs from product to use and result. The underlying dialogic between agents of materialisation and actors, their interconnectivity in network and feedback is perhaps unique to the newly developing and evolving CR industry much due to the inherent nature of the product. The CR has features as a product that allows for it to be customisable, which means it needs technological expertise in programming and deployment to a specific work situation. This opens up a new field of service engineers known as integrators. Integrators can belong to various companies, the producer's, the cus-

customer's or end user's or they may well be autonomous agents acting in their own enterprise. As such, the characterisation of a CR PSS and its resulting business model is unlike the more traditional manufacturing enterprises that sell machines and then increasingly offer services. The CR is conceptualised and exists in its own eco-system of a CR PSS the moment it is ordered from the manufacturer. The manufacturer, together with the integrator might even do a scouting trip to the work area of the customer/end user in order to design a work cell where the CR can work together or alongside with a human operator. As such, the services offered in a CR PSS begins even before the product is delivered, the programming steps or assembly steps to the cell worked out and designed before product delivery. In the CR PSS business model, product-service is usually sold as one unit. What could then be considered is the use oriented business model, the discussion being whether the manufacturer will loan CRs and if so, on what basis, functions and for how long in a financial year or production cycle year.

#### 4.5. Research design and methodological application

Apart from the complementing views of Agency/Actorship behind the Type of Sensing and Intent in a CR PSS that the Pronoun system can share with more generic characterisations of PSSs, the four quadrant model has a further research design and methodology application in the study of PSSs.

Each quadrant lends a perspective that when consistently acquired after, would accumulate a body of knowledge that is specific to that perspective. As illustrated, a deeper understanding of the different business models of each PSS orientation type can be reached by designing research questions pertaining to that perspective. For the UL quadrant, phenomenological research studies pertaining to individual level actors of a PSS might lend insight into human talent management when implementing new technologies, or technology acceptance by individuals when introduced to new systems for example, can be designed. The LL quadrant has a strong sense for the collective "We" that includes most studies in PSSs with regards to how communication between actors (intra- or inter-firm level analysis) in a PSS might influence the development of current business models or business paradigm within the industry. There is a strong underlying aspect of culture and collective consciousness when people interact with each other, so it is in this LL quadrant that many ethnomethodological and anthropological type studies can be adopted for PSS orientation study. Research inquiry pertaining to the UR quadrant could be examples of technological studies where engineering expertise is tested for a specific product-service function. For the CR as a product, it would be in this quadrant that knowledge about product capacity for accuracy in assembly and ease of programming can be empirically observed and tested with quantitative feedback. Predominant research methods employed for such studies situated in the UR quadrant include cognitive science for the study of CR behaviours and skills performance testing (human and CR behaviours for example). The UR quadrant within the field of engineering, bio-engineering and material sciences for example, would render most expertise and knowledge on CR as a product built in tandem with current digital, cyber-physical systems. Knowledge and research on the larger network systems view and system of systems view pertain to the LR quadrant. International policies for PSSs and in particular CR PSSs for example, could come under the LR quadrant. Current pursuance of industry standards and future factories where all machines are communicatively compatible and can operate across different platforms simultaneously are studies that could be placed within the LR quadrant arena of knowledge of PSSs. A detailed research design when considering all Pronoun system perspectives could help researchers map current knowledge of the field, and identify knowledge gaps in the field of inquiry. The Pronoun system model unfolds areas of knowledge reached and areas of knowledge to be acquired.

## 5. Conclusion

This study has tried to address the observed fragmentation of theory and concepts in the field of PSSs studies. Taking the past decade's scholastic literature that indicates that the PSS has broadly been investigated from a tripartite perspective of product, use and result orientation, this study illustrates how an applied linguistics approach as qualitative method of study with regards to Type of Sensing and Intent can be used as a cohesive element of study towards a more integral / holistic view in PSS theory and concept. The findings, founded in a more specific CR PSS, where the CR industry is young and fast developing, are meant to complement findings of current studies of other PSSs. The integrated findings are illustrated in Figure 4. An understanding of Intent, its actors and how the elements of the different perspectives interact with each other in a CR PSS can help researchers understand the directionality of development, or evolutionary path of a CR PSS.

From an industrial application perspective, the method use and results from the study of Intent in a CR PSS through transitivity analysis and Type of Sensing suggest that a CR PSS is indeed an eco-system of co-evolution between all actors in a CR PSS. For a CR PSS, a study of Intent shows that it becomes difficult to study any part of a CR PSS orientation (product, use or result oriented) in isolation. While studies on other PSSs can come from a pure product or pure service perspective (perhaps now more rare due to what a convergence in technologies allow in interconnectedness), in reality, even the cline of product-service orientation has been illustrated to be a constant negotiation loop of co-creation of product and service provided.

In address to the ongoing scholastic debate on defining the sustainability element of any PSS, perhaps what this study of Intent, taking a CR PSS as example, has revealed is that in PSSs, even if implicit, sustainability is an inherent element or awareness that is embedded in its processes. The questions that can then be addressed are not whether PSSs are sustainable but rather, in what manner can they continue to optimally evolve (be co-agently manufactured by producers, integrators and users/customers) within such an operating framework.

Scholastic research methodology perspective, the unfolding of the Pronoun system of perspectives potentially introduces new ways of seeing and studying a PSS. Each quadrant and zone of knowledge can be studied in detail, mapped for state-of-art as well as identified for knowledge gaps to be filled. The application of the four-quadrant Pronoun system model is not only relative in perspective, but relative to context of researcher intent and use. The limitation to this study is in effect the numerous other variables that constitute both the SFL framework of analysis and PSSs. SFL as an applied theory and framework of linguistic analysis consists of a rich set of tools for qualitative and quantified qualitative text analysis. The combination of types of study for SFL applied method in understanding of PSSs is broad and might take a concerted effort of research interest to fulfil, for which SFL in itself represents a niche area of study even in the field of applied linguistics.

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# MOTIVATORS AND INHIBITORS OF E-RESIDENCY ADOPTION FOR ENTREPRENEURIAL PURPOSES

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**Abstract.** *The study investigates the motivators and inhibitors of Estonian e-Residency adoption for international virtual entrepreneurship purposes. The theory of Diffusion of Innovations is applied to conduct a qualitative investigation from adopters' perspective. Findings show that a number of elements characterize the e-Residency adoption process and that such a process might be more complicated than what is expected at first glance. The main contribution of the article consists in the empirical investigation of a new type of e-government service, namely e-Residency, that might favor the establishment of virtual entrepreneurs in Estonia.*

**Key Words:** *E-services, e-Residency, Innovation, Adoption, Entrepreneurship*

## 1. Introduction

In recent years, entrepreneurship has been undergoing a fundamental transformation due to synergies between Information and Communication Technology (ICT) development, especially e-services and changing paradigms of economic transactions. This has reflected rapid and radical changes that are influencing the global marketplaces resulting into new forms of entrepreneurship and business practices. Although some of the long-established entrepreneurial concepts might still be applicable, much of the context, in which activities related to entrepreneurship are manifested, has changed significantly in a relatively short period of time (Matlay; Westhead, 2005).

One of the recent technological innovations influencing entrepreneurial practices in the global sphere is Estonian e-Residency, launched in 2014 (Kotka; Castillo; Korjus, 2015). E-Residency is a 'transnational digital identity' in the form of an eID card (e-Estonia n.d.) that allows access to electronic services in Estonia, regardless of where one is physically residing, including the possibility of founding and managing a location-independent business (Kotka; Castillo; Korjus, 2015).

As e-Residency can be used as a tool for online company establishment, the object of study is inspected as a part of the context of e-entrepreneurship. The purpose of this study is to investigate the motivators and inhibitors of the adoption process of e-Residency for entrepreneurial purposes from the users' perspective. E-Residency is a rather new concept, thus very little research has been conducted on what motivates individuals to apply for e-Residency for entrepreneurial purposes and what kind of barriers e-entrepreneurs meet in adopting it. Furthermore, the adoption of electronic identities as a specific type of e-service in general has not received wide academic attention either, especially from an entrepreneurship perspective (Miltgen, 2010). This study aims to address this gap and the following research question is proposed:

What are the most significant motivators and inhibitors to e-Residency adoption for entrepreneurial purposes, and how do they influence this process?

This research takes the starting point in Rogers' (2003) Diffusion of Innovations theory and conducts a qualitative study of entrepreneurs that have started an online company in Estonia by using e-Residency, or are intending to do so. The investigation aims to capture the perspectives of the innovators and/or early adopters (Rogers, 2003).

The article is structured as follows. The introduction has presented the background of the article and the following section will continue the introduction of e-Residency in greater depth. The third section briefly presents the theoretical background of the study including concepts of e-entrepreneurship and innovation adoption. The fourth section describes the research methods. The fifth section presents the analysis and findings followed by a discussion. Finally, the last section presents some concluding remarks. The limitations of the study and potentiality for further research are also discussed as a part of the final section.

## 2. E-Residency

In Estonia most of the regular daily activities provided by both the public and private sectors have been transformed into e-services. The fundamental technical and policy element in the technological ecosystem of Estonia is considered to be the country's e-government infrastructure. This infrastructure integrates the nation's ID code system; 'isikukood' and digital platform; 'X-Road'. All e-services provided by the Estonian government, business transactions and banking operations are connected to X-Road and can be accessed with isikukood in the form of an eID card (Kotka; Castillo; Korjus, 2015). E-Residency is a unique identity on the online environment based on this eID system. The concept of e-Residency is defined here as a set of information about an individual, constructing "a unique identifier for an individual which can be stored in an electronic form" (Miltgen, 2010, 1).

The e-Residency project was initiated by the Estonian government with an initial objective to contribute to the development of the country's economy, science, culture and education (Kerikmäe; Särav, 2015). E-Residency allows electronic identification and authentication, encryption of documents, digital signature, and access electronic services in Estonia (Kotka; Castillo; Korjus, 2015). Within this system, there are roughly 600 e-services available for citizens, and 2,400 for businesses (Sullivan, 2014) including e-banking, tax declaration, (Kotka; Castillo; Korjus, 2015) and registration of a new company (eGovernment in Estonia, 2016). E-Residency together with the existing e-services in Estonia enables establishing 'a location-independent business online' (e-Estonia n.d.). Particularly, e-Residency has the potential of making a difference for individuals who are from countries where electronic services are lacking, or setting up a business can be time consuming and challenging due to national level bureaucracy. In such cases, e-Residency can be seen as a solution (Kotka; Castillo; Korjus, 2015). Up to 14.04.2016, there had been close to 10 000 applications from 127 different countries. In March 2016 there were 1001 companies owned by e-Residents, and 975 e-Residents were engaged with companies, as shareholders for instance. The number of completely new firms established by e-Residents was 485 (e-Residency Dashboard n.d., a).

### 3. Theoretical Concepts and their Interrelations

#### 3.1. E-Entrepreneurship

Entrepreneurship has been distinguished as a major force in the economy on a global scale, and it has been defined in terms of creation of new business enterprises, innovation, introduction of new products or services, and/or entering new markets (Frølund; Teigland; Flåten, 2011). The Internet can be seen as a new and pioneering area for entrepreneurship as it offers opportunities for “developing new markets where virtual products/services are offered in a virtual small business by entrepreneurs” (Frølund; Flåten, 2011, 9).

In digital context, entrepreneurship is referred to as e-entrepreneurship (Matlay; Westhead, 2005). E-entrepreneurship can be characterized as “an innovative business practice that enables business opportunities to be detected and seized”, which is primarily based on technological innovations, and oriented at digitalization of some or all areas of business operations and activities (Jelonek, 2015, 1014). The activities include seeking for opportunities to implement innovations, such as new internet technologies, to change traditional business practices into e-business models as well as improve and accelerate information exchange (Jelonek, 2015). Diffusion of the Internet and other ‘smart’ (WIFI compatible) ICT innovations has also enabled the inception of the phenomenon of ‘absent presence’ - one being physically present at one place while absorbed by a virtually mediated world elsewhere (O’Brien, 2012).

#### 3.2. Diffusion of Innovations

Diffusion of Innovations (DOI) theory is based on perceptions of a unit of adoption, about the attributes of an innovation under inspection (Rohani; Hussin, 2015). Innovation is “an idea, practice, or object that is perceived as new by an individual” that offers a new alternative(s) and/or completely new means of solving problems (Rogers, 2003, 37). Diffusion is characterized by Rogers’ (2003, 37) as “the process by which an innovation is communicated through certain channels over time between the members of a social society”. Besides, Xiaojun et al. (2015) emphasized the characteristics of adopters as determinant for the diffusion of particularly IT innovations. The willingness to adopt new ideas is influenced by the characteristics of individuals, such as socioeconomic status (Rogers, 2003), motivation to change, tolerance for ambiguity, and perceived needs (Murray, 2009).

##### 3.2.1. Innovation-Decision Process

Rogers (2003) identifies five steps in the process of adoption of an innovation: (1) knowledge stage, (2) persuasion stage, (3) decision stage, (4) implementation stage and (5) confirmation stage. The innovation-decision processes might vary among innovations and social systems, and thus the five stages can occur in different sequences (Rogers, 2003).

At the initial knowledge stage (1), Rogers (2003, 171) explains knowledge to occur “when an individual ... is exposed to an innovation’s existence and gains an understanding of how it functions”. A need can be developed when an individual

learns that an innovation exists, and can generate motivation to learn more about it, which may potentially lead to the adoption of the innovation. Innovations can be developed to create needs, and vice versa (Rogers, 2003).

At the persuasion stage (2) an individual “forms a favorable or an unfavorable attitude towards the innovation” (Rogers, 2003, 174). Typical activities at this stage include seeking and interpreting information about the innovation and deciding the credibility of these messages. Based on these activities, the individual develops a general perception of the innovation, which can involve forward planning (Rogers, 2003).

The third stage is referred as the decision stage, which “takes place when an individual ... engages in activities that lead to a choice to adopt or reject the innovation” (Rogers, 2003, 177). Uncertainty is inherent in the process of adopting a new idea. Although Rogers (2003) proposes the third stage as the adoption decision stage, it is acknowledged that each stage of the innovation-decision process is a potential rejection point. Even though an individual decides to adopt an innovation, this does not necessarily proceed further to implementation. Rogers’ (2003) refers to such occasion as discontinuance. In contrast, an individual might initially reject an innovation, and decide to adopt it later on (Rogers, 2003).

At the implementation stage (4) individual begins to use a new idea (Rogers, 2003). For Rogers (2003) it is two different things to decide to adopt an innovation and actually putting the new idea into use, as at the implementation stage, problems regarding the actual usage may crop up. Therefore, levels of uncertainty about the expected consequences in regards to the new idea still prevail although the adoption decision has been made. In order to counteract uncertainties, information seeking is usually involved at the implementation stage as well (Rogers, 2003).

The final conformation stage (5) “takes place when an individual seeks reinforcement of an innovation-decision already made, but he or she may reverse this previous decision if exposed to conflicting messages about the innovation” (Rogers, 2003, 189).

### 3.2.2. Attributes of Innovation

The innovation-decision process is influenced by the perceived attributes of the innovation (Sahin, 2006), which determine the success of the adoption (Rohani; Hussin, 2015). Rogers’ DOI theory outlines a schema for evaluating the perceived attributes of an innovation that includes five different constructs; relative advantage, compatibility, complexity, observability, and trialability (Black et al., 2001).

The attribute of relative advantage is essentially domain specific and it is concerned with the perception of a potential adopter as evaluating an innovation as being better than the idea, product or service it overrides (Black et al., 2001). Compatibility is “the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters” (Rogers; 2003, 15), such as existing business practices and processes (Rohani; Hussin, 2015). Complexity is “the degree to which an innovation is perceived as relatively difficult to understand and use” by the adopter (Rogers, 2003, 16). Excessive complexity of a new idea is an obstacle and negatively influences the adoption (Sahin, 2006). Observability is “the degree to which the results of an innovation are visible to others” in a social system (Rogers, 2003, 16). Trialability is “the degree to which an innovation may be experienced with

on a limited basis” before any decision to adopt has been done (Rogers, 2003, 16). The opportunity to trial an adoption of an innovation is an effective mechanism for reducing uncertainty (Black et al., 2001).

### 3.3. Conceptual Model Development

Rogers’ (2003) model of the innovation-decision process is used as a seminal model in this research. However, it is necessary to consider the adaptability of the perceived attributes to this research, as they are not necessarily applicable with the study of the innovation at hand. Rogers’ DOI theory does not define clearly whether the attribute of observability assesses observability per se as innovation, or consequences of its adoption, being visible and communicable to others, or observability of compatibility, or effects or costs, for instance (Tanakinjal, 2012). Although e-Residency does appear in the physical form of an eID card, the dimension of observability is not included to the conceptual model, as the nature of the innovation is considered as digitalized and thus cannot be observed by others as such.

The conceptual model (see Figure 1 below) considers the five steps of the innovation-decision process, and the attributes of relative advantage, compatibility and trialability as to inspect the prospective drivers of the adoption (Miltgen, 2010). Attributes of complexity and perceived risk are also included to the model as the inherent involvement of uncertainty is acknowledged (Rogers, 2003, Miltgen, 2010). The selected attributes for the model are assumed to influence the adoption process, and particularly the persuasion stage as proposed in Rogers’ (2003) original model.

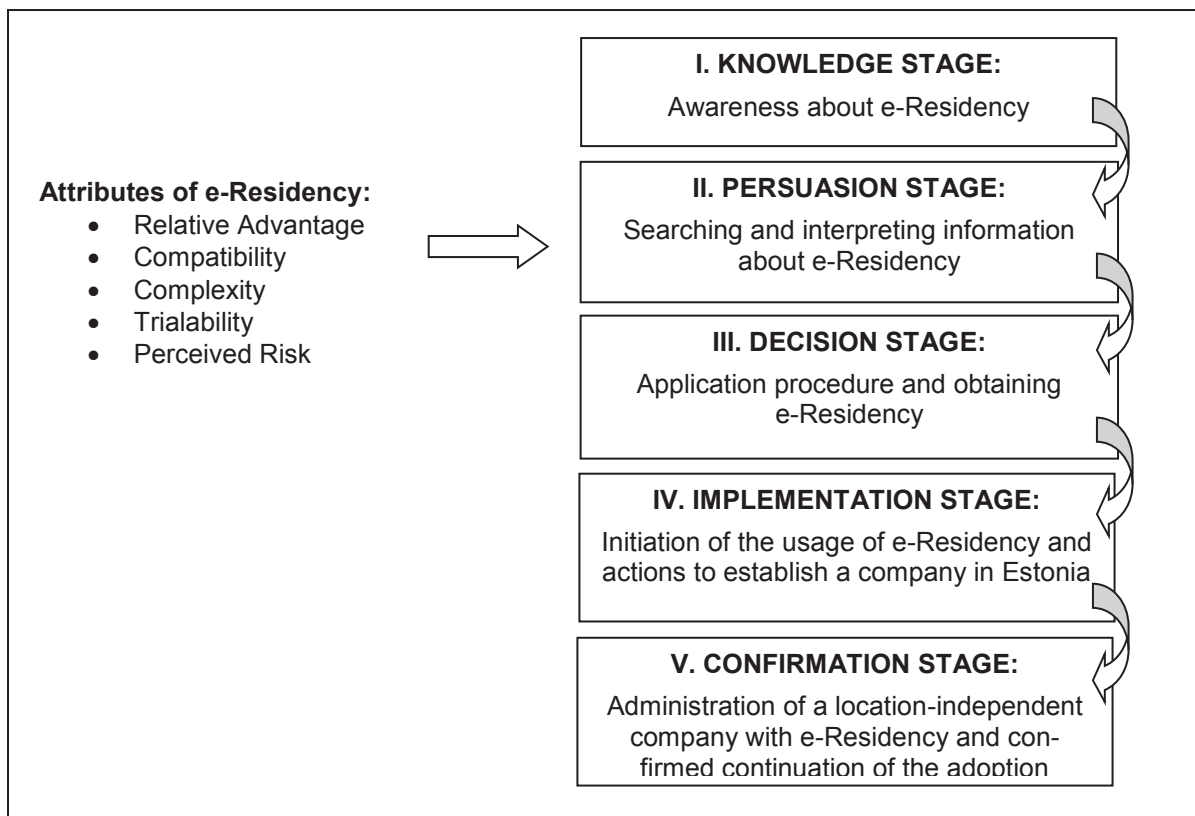


Figure 1: Proposed conceptual model of adopting e-Residency for entrepreneurial purposes (adapted from Rogers, 2003,170)

## **4. Research Methods**

Rogers' DOI theory can be acknowledged as a middle-range theory (Roman, 2003). The conceptual model (Figure 1) serves as a guideline for the data collection and analysis by a) adjusting the scope for data collection, b) providing a fundamental chronology for primary data collection, and c) organizing the analysis and presentation of the findings. The qualitative research method was chosen in accordance to the nature of the object of study (Strauss; Corbin, 1998).

### **4.1. Data Collection Process**

The data sources included secondary and primary data. The primary data involved exploratory and semi-structured personal interviews, a group interview and web-based questionnaire.

Potential informants for personal interviews were contacted through a Facebook group called 'Estonian e-Residents' by posting an invitation to the group's wall to take part in the research. The informants were selected (among those willing to participate) according to the following criteria: a) had obtained e-Residency and b) were already utilizing, or had intentions to utilize e-Residency for entrepreneurial purposes in Estonia. Before each interview, the informants were requested to fill in a web-questionnaire consisting of questions regarding their background. The personal interviews were conducted between December 2015 and February 2016 via Skype as the informants were geographically dispersed. Each interview lasted for approximately one hour, was audio recorded and immediately transcribed verbatim after its completion. Besides the personal interviews, an exploratory group interview was conducted with three respondents that were interested in establishing a business in Estonia with e-Residency, but had not yet done so. The group interview was conducted on a face-to-face basis.

The primary data collection stopped when no further entrepreneurs satisfying the selection criteria above were willing to participate to the study. However, given the different backgrounds of the informants allowed understanding different motivators and inhibitors of e-Residency adoption for entrepreneurial purposes. Due to the in-depth nature of the interviews, the amount of collected data was found adequate as it also reached a saturation point. Please refer to Table 1: 'Informant profiles' for information about the informants and their stage in the e-Residency adoption process.

Informant	Nationality	Time of becoming aware of e-Residency	Time of obtaining e-Residency	Stage at the innovation-decision process
<b>A</b>	French	December 2014	March 2015	Confirmation stage – Informant has established a company in Estonia with e-Residency, the adoption is seen as complete
<b>B</b>	Indian	July 2015	December 2015	Implementation stage - Informant has obtained e-Residency and is planning to establish a company either in Estonia or another European country
<b>C</b>	Bolivian	June 2015	December 2015	Implementation stage - Informant has obtained e-Residency and is planning to establish a company either in Estonia or another European country
<b>D</b>	American	October 2014 or earlier	September 2015	Confirmation stage - Informant uses e-Residency to remotely manage an existing company in Estonia
<b>E</b>	all of Anguillan/ Canadian/ British	December 2014	March 2015	Implementation stage – Informant has registered a business with e-Residency in Estonia, the adoption process has discontinued due to externally occurred barriers
<b>F</b>	Canadian	October 2014 or earlier	March 2015	Implementation stage – Informant has obtained e-Residency and is planning to establish a company in Estonia, but other countries are also considered
<b>G</b>	Greek	September 2015	November 2015	Implementation stage – Informant has registered a business with e-Residency in Estonia, but the implementation is incomplete
<b>H</b>	German	September 2015		Decision Stage - Informant has intentions to apply for e-Residency and establish a company in Estonia
<b>I</b>	Danish	September 2015		Decision Stage - Informant has intentions to apply for e-Residency and establish a company in Estonia
<b>J</b>	Canadian	September 2015		Decision Stage – Informant has intentions to apply for e-Residency and establish a company in Estonia

Table 1: Informant profiles

To complement the primary data, secondary sources were used, including a range of academic and government reports on e-Residency. This material proved valuable insight for understanding the societal, political and technological trends of the e-Residency project.



## **4.2. Data Analysis**

The analysis of the primary data was conducted according to Elo and Kyngäs' (2008) three stages: 1) preparation, 2) organizing and 3) reporting. At the preparation phase, the transcripts were read through several times to make sense of it as a whole (Elo; Kyngäs, 2008). Strauss and Corbin (1998) referred to such a coding method as open coding. At the organizing phase, sentences and paragraphs found essential for the study were selected for further inspection and are included in the analysis where appropriate at the reporting stage (Elo; Kyngäs, 2008).

## **5. Analysis and Findings**

The analysis section is mainly organized into two parts. The steps of the innovation-decision process are presented in the first one, while the perceived attributes in the latter one. The chapter is completed with the summary of the findings.

### **5.1. Innovation-Decision Process**

#### **5.1.1. Knowledge and Persuasion Stage**

The data show that the knowledge and persuasion stages are very intertwined in the case of e-Residency adoption. The respondents got first acquainted with e-Residency through mass media such as an Estonian television show, an airplane magazine and an online article as well as social media-based interpersonal channels. The major initial reactions were excitement and curiosity. After being initially exposed to the concept, most of the informants described how they were keen on acquiring more information about the innovation (Knowledge stage).

“When I read about it in the Internet, I saw it was something for me so then I was determined to find out how to apply” (informant G).

From the transcripts, a need or an urge to become affiliated with e-Residency was also evident (Persuasion stage), as illustrated in the following statement:

“I wanted to see what is this [e-Residency] and be a part of it because I wanted to be in, let's say, everything that is growing, be part of it” (informant G)

The informants perceived something consistent between the concept of e-Residency and their existing needs and practices for entrepreneurship. Thus they searched information to understand how the adoption of such innovation can respond to those needs and provide value for them. The level of thoroughness of seeking and interpreting information was found variant among the informants, which had an impact at the later phases of the adoption process. Most of the informants thoroughly searched for information for a long period of time and consulted different sources in order to comprehend the concept of e-Residency and how it works.

“I immediately followed all the different websites, watched what's happening, learned everything I could about it” (informant E).

However, one informant made first the decision to apply for e-Residency, and then further explored and interpreted the concept afterwards.

“I was like why not to explore, I will apply for it and then read what it's about. More or less that was my idea” (informant C).

### 5.1.2. Decision Stage

There was a consensus among the informants that applying for e-Residency was a fairly easy, straightforward and simple procedure that could be conducted in an acceptable timeframe. However, the procedure of obtaining e-Residency also includes picking up the eID card from an Estonian authority, which outside of the country means Estonian embassies. The informants found this part to potentially require the most effort and resources due to the prospective geographical distance to the Estonian Embassy.

“The card itself cost like 85 euros or something like that, to get the card cost me like three or four hundred dollars, transport and hotel and everything around it, it was a bit deceiving”(informant F).

One potential moment of rejection can be identified at the point of obtaining e-Residency, prior to the actual implementation. What makes this phase a potential rejection point can be demonstrated by referring back to the discussion at the persuasion stage, and the informant C whose decision to apply for e-Residency was interpreted as occurred prior the persuasion stage. The informant C expressed feelings of disappointment after obtaining e-Residency due to the fact that the initial expectations prior the application did not correspond with knowledge acquired afterwards. This suggests that such a sequence of stages at the adoption process caused an inconsistency between the adopter's expectations and anticipated consequences of the innovation. The absence of a thorough persuasion stage prior the application caused that the adopter did not form an adequate perception of the required procedures and perceived risks attached to the adoption. This is further illustrated by the informant C in the following statement;

“If you read the ads, or the marketing material, looks like once you get the e-card, you can open a company immediately online .... That's really far from the reality, that's something I got kind of disappointed...” (informant C).

The reliance on a rather small amount and sources of information at the point of applying followed by signs of disappointment after obtaining e-Residency can be seen as linked together. This implies that the persuasion stage is a significant part of the adoption process, and supports the idea of e-Residency as knowledge-intensive innovation requiring considerable learning effort from the unit of adoption, such as emphasized by Laukkanen, Sinkkonen and Laukkanen (2007).

### 5.1.3. Implementation Stage

The data show that the degree of ICT competency and the perceived newness of the innovation were related to the perceived level of difficulty during the implementation stage. As the features of e-Residency were perceived as a completely new idea or practice, the role of the channels of communication were found to be very important. For example, informant E described how he needed to be consulted with more IT competent person when initiating to use the eID card;

“Even though I have some technical background ... If I haven't had someone at my side I would have had trouble, I might have given up frankly if I weren't as dedicated to this concept as I was...” (informant E).

Regarding the actual implementation of e-Residency for entrepreneurial purposes, three main components were identified as parts of establishing a company as an e-Resident: a) finding a virtual-office provider, b) online registration of a company and c) opening a business bank account in a local Estonian bank. Besides of gaining understanding of the functionalities of the innovation itself, the data show that the unit of adoption is required to acquire knowledge regarding the Estonian legal environment for businesses in order to complete the implementation. One of the major issues with this requirement was the role of information, or lack of it, which also included a lack of visual demonstration. The following statement of the informant A exemplifies the role of information and the need of know-how required when establishing a company in Estonia with e-Residency;

“I read some stuff here and there, there is not enough emotional explanation, there is not enough proper visual relationship with the concept ... you need to acquire knowledge and know-how, there is the technical side and then there is the know-how“ (informant A).

One of the components of the virtual company formation is the requirement of a legal address in Estonia for the firm. To do this, virtual-office providers need to get involved in the adoption process as third parties by providing a legal address. This requirement was unexpected for some informants. Thus the practice of finding and selecting a virtual office provider was found to require time and effort. However, the involvement of the third parties was simultaneously seen as enhancing the adoption process, as the data showed them to be an essential channel of communication through their role of passing on technical and legal know-how. Therefore, the utilization of the services of a third party can reduce uncertainty and other obstacles, such legal issues.

The data indicates some prevailing misunderstandings and/or different interpretations, particularly what e-Residency actually allows adopters to do to gain the expected value. In fact, some of the informants found the information provided on the different governmental sites misleading, or that the required actions in relation to establishing a company with e-Residency were not clear from the beginning, and were encountered as unexpected. The informants initially interpreted that the whole implementation procedure could be conducted independently and completely online with the eID card and other different e-services. This was however not the case in reality at the point of conducting the research. The data showed that a prerequisite for a business bank account in Estonia was a visit at a local bank in Estonia for physical identification (Kerikmäe; Särav, 2015). This barrier was greater the further geographically an e-Resident is physically residing from Estonia, as travelling to the country requires effort and resources, such as time, money and/or a visa. On the contrary, some informants also found such a visit to the country beneficial in terms of business networking and creating contacts, as illustrated in the following statement;

“I was a bit pissed off that I had to go there, and the other end ... I also was basically super happy to meet people from the e-Residency community ... Create some contacts and create some bonding“ (informant A).

### 5.1.4. Confirmation Stage

The informants were generally satisfied with their decision to apply for e-Residency. The informants expressed their beliefs in the future of e-Residency and they had intentions to continue with their virtual company project to see the potential evolution of e-Residency, especially improvements regarding the company establishment procedure as well as availability of information. Solving issues regarding these factors is not a task left completely to the provider of the innovation. The informants believed that also third parties should be involved.

## 5.2. Attributes of e-Residency

### 5.2.1. Relative Advantage

As a part of the commencing stages in the adoption process, the informants began to form a perception of the advantage and the value that the adoption of e-Residency could potentially bring to them business wise. The informants saw e-Residency as an opportunity to manage an existing business in Estonia, to establish a new company, or to relocate an existing business to Estonia, from outside of Europe. The informants from outside of Europe saw e-Residency as a portal for establishing a business in Europe. Besides of these motivators, other perceived advantages included costs, taxation, time efficiency, flexibility and establishment of credential status

The majority of the informants found service costs of virtual office providers reasonable and even cheaper compared to other countries in Europe. The Estonian tax system was perceived as beneficial for the type of businesses the informants were practicing, or were about to establish. Without entering a detailed description of the tax system, the informants found favorable and supporting that there is no tax on corporate income in Estonia. Start-up and maintenance costs as well as taxation can be perceived as external driving forces for the adoption of e-Residency, as they concern the operational environment for businesses in Estonia and are not directly involved with the innovation itself.

The fact that most of the adoption process as well as the post-adoption phases could be performed remotely online was perceived as time efficient and flexible. For example, informant A, with no previous entrepreneurial background, explained that simultaneously as becoming an entrepreneur in Estonia with e-Residency, he is able to focus on other activities where he is physically residing and considered obtaining e-Residency for entrepreneurial purposes to be a learning process as well:

“Running a business by doing... It's so easy to manage everything from where you live, it was basically a great way to learn how to do business for me” (Informant A).

The above quote further suggests an aspect, that adoption and further implementation of e-Residency can be also approached as a learning process for entrepreneurship.

Disclosing personal information and biometrics as a part of the application process was found reasonable and also beneficial. Estonian government was approached as a “trustable ID provider” (informant C). Especially the background check procedure based on the disclosed information in the application with each applicant was seen

as establishing a status of reliability and authenticity in digital identification as well as a credential of a noncriminal background. Such a credential status was further viewed as favorable when practicing international business.

### **5.2.2. Compatibility**

E-Residency was found to be consistent with existing entrepreneurial practices as well as to correspond with felt needs of the adopters that were commonly business related, as illustrated in the following statement of informant C:

“During my free time I was doing freelancing, so here in Europe I want to do the same, so I thought this one [e-Residency] would enable me to do this freelance thing” (informant C).

On the contrary, some of the informants seemed to attach some notions of physicality to the concept. This proclaims that the idea of e-Residency could lead to a situation where the unit of adoption had the possibility to entail rights to entry or reside in the country as expressed by informant B:

“A physical presence is a must for any business” (informant B)

The data also suggested a degree of compatibility with ICT among the informants as most of them had professional backgrounds in IT, indicating high level of ICT competency.

### **5.2.3. Trialability**

The unit of adoption cannot concretely try e-Residency prior obtaining it, i.e. log in with the eID card to the Estonian e-Government systems. Instead, in order to internalize its meaning and value prior the adoption, trialability is highly dependent on available information.

The official website of e-Residency ([www.e-estonia.com/e-residents](http://www.e-estonia.com/e-residents)) was one of the first sources to seek information. The information from this channel was not found to be adequate enough. Therefore, the adopters had the need to search information from other, unofficial, sources in order to create more complete understanding of the innovation, especially in regards to the implementation, as exemplified by the informant C by stating;

“First checked the e-Residency site ... well nothing much there ... I joined the Facebook group, and there were somewhat clear points what do you have to do in real life when founding a company” (informant C).

Media posts, social media and blogposts were found to play a role as well, which also indicates the importance of the evaluations of near-peers – individuals who have already adopted the innovation (Rogers, 2003). Issues related to quality of the information as well as the reliability of the source was raised in the data. Although, near-peers can be perceived as an important source of information to enhance the adoption process, the information from such a source should be treated with particular concern regarding its accuracy. Due to the perceived newness and the level of complexity involved in comprehending the concept of e-Residency, the

reliability of the channels of communication were found to be in important role to avoid and correct misunderstandings.

#### 5.2.4. Complexity

The level of perceived complexity is related to the prior conditions of the adopter and the level of compatibility with ICT. This is especially the case when the unit of adoption is not familiar with all the features of e-Residency in advance, such as electronic signatures, as exemplified by the informant A;

“I think they weren't communicating well the value of it [e-Residency]. The moment when they shared that video about signing online ... I think it's a one minute video or two minute video, I watched it two or three times... and I think I got it. I got the value... ” (informant A).

Understanding the features of the innovation equals internalizing its value, which may drive the prospective adopter to apply for e-Residency. Complexity can also be related to trialability and communication as hindering element in the adoption process.

#### 5.2.5. Perceived Risk

Obtaining e-Residency does not guarantee completion of the adoption process as the barriers in the implementation stage may hinder or even cause a discontinuance of the process, thus creating a risk for the adopter. Perceived risk in e-Residency adoption mainly consists of four dimensions: 1) access to a business bank account, 2) the role of information regulating levels of uncertainty, 3) attitudes towards a risk of personal data violation and 4) lack of know-how in relation to implementation.

Banks have power to hinder or even cause a discontinuance to the adoption, by regulating e-Residents' access to business bank accounts, which is an inevitable component for business practice. In addition, an adequate amount of information at the persuasion stage reduced the level of uncertainty. The data suggested that there is a lack of information regarding e-Residency, its value and implementation, which increases the perceived risks.

The informants expressed confidence in security and trust towards e-Residency. However, risks attached to the establishment of a threat of prospective misuse of a digital identity were acknowledged, for instance, by the informant F:

“Because I have it, I have one more way to be hacked, I have one more piece of identity so I have one more way to be stolen, for that identity be stolen” (informant F)

The informants' experience and knowledge of starting and managing a business also influenced the perceived uncertainty as stated by informant A;

“I'm not a business man, so a lot of it [adoption of e-Residency] were unanticipated ... I knew I would face uncertainties and I knew that I would have to deal with it but that's what I wanted, and still I have uncertainties in a way” (informant A).

### 5.3. Summary of the Findings

This chapter has presented the analysis and findings in accordance to the proposed conceptual model (Figure 1). In the analysis it became apparent that it is a challenge to identify elements in the adoption process of e-Residency as being specifically a motivator or inhibitor as each element was influenced by other elements of the process as well as they were influenced by the characteristics and prior experience of the informants. This challenge was been dealt with by positioning the elements where they were found mostly fitting. The results of the overall analysis are summarized in Table 2 'Summary of the findings'.

Motivators:		Inhibitors:
<b>Innovation-Decision Process</b>		
Knowledge Stage	Perceived newness, excitement and curiosity towards e-Residency	
Persuasion Stage		Time and effort of seeking information and understanding the concept of e-Residency and its features
Decision Stage	Straightforwardness and simplicity of the application procedure	Required effort and resources regarding the eID card pick up
Implementation Stage	Virtual office providers assisting with the technical and legal chasm around e-Residency	<ul style="list-style-type: none"> <li>• Involvement of third parties</li> <li>• Required ICT competency</li> <li>• Issues with information regarding company formation procedure</li> </ul>
Confirmation Stage	Belief in the future of e-Residency	
<b>Perceived Attributes</b>		
Relative Advantage	<ul style="list-style-type: none"> <li>• Opportunity and a tool for a) managing an existing business, b) establishing a new company and c) relocating an existing business to Estonia</li> <li>• Start-up and maintenance costs</li> <li>• Estonian legal framework: taxation</li> <li>• Time efficiency and flexibility</li> <li>• Establishment of credential status</li> </ul>	
Compatibility	<ul style="list-style-type: none"> <li>• Consistency with existing entrepreneurial needs and practices</li> <li>• ICT-competency</li> </ul>	
Trialability	Communication with nearpeers in social media	Lack of accuracy and availability of information
Complexity		Perceived newness and high knowledge intensity
Perceived Risk		<ul style="list-style-type: none"> <li>• Uncertainty in relation to accessing a business bank account</li> <li>• Existing risk of a misuse of a digital identity</li> <li>• Lack of know-how in relation to company establishment in Estonia</li> </ul>

Table 2: Summary of the findings

## 6. Discussion

By applying Rogers' Diffusion of Innovation theory to this research, this study has contributed to the existing literature on innovation diffusion. Furthermore, the study has provided an insight to the adoption process of e-Residency in the context of e-entrepreneurship. The empirical evidence presented in the previous chapter as embedded into the conceptual model demonstrated the applicability of the chosen theoretical framework (Elo; Kyngäs, 2008). The analysis highlighted the special characteristics of the object of study and illustrated that specified series of stages exist in the adoption process of e-Residency, as suggested in Rogers' (2003) innovation-decision process model. Furthermore, the findings corroborated with Rogers' (2003) prediction, that it is a different thing to decide to adopt an innovation, and actually use it. As such, a potential rejection point was identified after the point of obtaining e-Residency, and the major obstacles were found to concern mainly the implementation phase. Kerikmäe and Särav (2015, 78) explain that since the introduction of e-Residency, the scheme has been encountering obstructions due to lack of thorough judgement and "harmonization between the legal, administrative and policy capacities". The issues related to accessing a business bank account can be counted within such obstructions as already noted by Kotka, Castillo and Korjus (2015) as well as Kerikmäe and Särav (2015). The findings of this study corroborate these results. For example as banks have the power to approve or not the provision of a business bank account, they are a definite perceived risk to consider and more importantly create an inhibitor that may cause a discontinuance in the adoption process.

The analysis illustrated that e-Residency in its entirety can be rather difficult for potential entrepreneurs to comprehend. Different degrees of perceived complexity are involved, which requires further effort in seeking and interpreting information that can be time-consuming. This is in line with Laukkanen, Sinkkonen and Laukkanen (2007), as they argued that especially the adoption of knowledge-intensive technological innovations require considerable learning effort, and thus the information should be detailed enough and easily accessible and available on websites. The degree of complexity and the required learning effort can be explained to some extent by the various features and perceived newness of the innovation, the governmental context of Estonia, and hence the involvement of the third parties as well as the fact that the units of adoption are globally spread. Therefore, the occurrence and thoroughness of the persuasion stage prior obtaining e-Residency can be predicted to be an enhancing factor for the rest of the adoption process, increasing the degree of involvement and reducing uncertainties. On the contrary, less effort spent on acquiring knowledge was found to be linked with higher degrees of uncertainty, perceived risks as well as a possible cause for 'misconceptions'. This can further cause unexpected and negatively perceivable encounters as well as generate a potential rejection point as the anticipated consequences are not met. Therefore, the role of communication channels is highlighted, as misconceptions were found to exist in relation to the innovation and its implementation for entrepreneurial purposes.

The analysis made it apparent that it was challenging to identify some elements in the adoption process as being specifically a motivator or a inhibitor as they were influenced by other elements of the process, such as communication as well as the characteristics and prior experiences of the informants. The fact that third parties in-



volved in the implementation of e-Residency for entrepreneurial purposes does not necessarily construct a barrier as such. Instead it is more a matter how these factors are perceived as influencing the adoption process, which constructs the hindering element. These perceived hindrances can be seen intertwined with information about e-Residency.

The findings showed that the available information through the official channels of communication, such as the official website of e-Residency, was inadequate to some degree. The issue might be that the information does not fully correspond with the needs and demands of the units of adoption as the findings unveiled an existing need to seek information from multiple sources. The information issue is relevant because some features of e-Residency were perceived as completely new concepts. This is in line with the concern raised by Kerikmäe and Särav (2015, 77) that “most future e-Residents might not, upon application, know the necessity of use of digital ID”. To reduce the perceived complexity, and the required efforts from the unit of adoption, the findings suggested a need for enhancing the trialability of the innovation in the form of educating the users by providing more visual connection and guidance with the innovation and the actual practice of it.

Due to the limitations of the official sources, the units of adoption had to seek for information from other sources, including ‘unofficial’ ones, such as social media. A risk of inaccuracy of information thus existed as the content circulating in those channels is not monitored and thus might not be consistent with reality. Therefore, information sought from unofficial sources may be a reason for prevailing blurry conceptions. Laukkanen, Sinkkonen and Laukkanen (2007) considered a possible supply of misinformation as a hindering element for adoption process. Besides of acquiring know-how and reducing existing uncertainties with the communication with near peers, the involvement with social media channels can be also seen as illustrating a need or an interest of a creation and belonging to a community around e-Residency. Therefore, near-peers can be viewed as having an enhancing effect on the adoption process.

The role of channels of communication was evident throughout the analysis of the adoption process although it was not the main focus of the study but it is found to have a major influence on the perceived driving and hindering features. It is a challenge to draw further arguments on the matter based on the collected data. However, it can be concluded that the role of communication with the e-Residency adoption can be seen as ambiguous and thus controversial. The reported experienced misconceptions and issues unexpectedly cropping up during the adoption process, indicate that information related complications exists.

## **7. Conclusion**

The main purpose of this study has been to investigate the major motivators and inhibitors of e-Residency adoption process for entrepreneurial purposes. The methodology applied Diffusion of Innovations theory together with a construct of perceived risk to compose the conceptual model to guide the qualitative inquiry. The empirical results were embedded into the proposed conceptual model, which demonstrates the applicability of the chosen theoretical framework (Elo; Kyngäs, 2008). The application of the conceptual model illustrated that specified series of

stages exist in the adoption process, and it highlighted the special characteristics of the particular object of study.

E-Residency is a globally diffused innovation, and thus heterogeneity within the social system exists. The adoption process consists of rather identical phases; the unit of adoption passes through the steps of gaining preliminary awareness and then further knowledge about e-Residency, obtaining the e-ID card and further implementing the innovation for entrepreneurial purposes - which is another process itself. Accessing a business bank account is an inevitable part of this process, and a perceived risk. The findings are corroborating with the prediction, that the application procedure for e-Residency can be characterized as a rather simple and straightforward procedure, and that most of the complications occur regarding the implementation phase. This is an illustration of a distinction of what Rogers' (2003) argued: it is a different thing to decide to adopt an innovation, and actually use it. As such, a potential rejection point was identified at this very distinguishing point, and the major obstacles were found to concern mainly the implementation of e-Residency.

The perceptions regarding the attributes of e-Residency vary among adopters, as they represent i.e. different sociodemographic statuses. Adopters' backgrounds, or contexts, imply how different aspects in the adoption process are encountered. The results unveiled various elements and perspectives, from which some can be perceived more as a motivator or an inhibitor in different degrees. Some of the identified elements can be seen as inevitably involved in the adoption process, while some can vary in accordance to the unit of adoption and the role of channels of communications.

E-Residency is highly knowledge-intensive innovation due to the perceived degrees of complexity and the aspect of trialability. Thus the identified hindrances were tied to information issues. Considerable learning effort is required to understand e-Residency. The perceived newness and complexity embedded in the legal environment of Estonia also highlighted the importance of communication. Issues with information and lack of acquired know-how were found to increase the notion of uncertainty and also cause inconsistencies between expectations and anticipated consequences. The implementation requires effort and resources as well as calls for consultation regarding the technical and legal chasm around e-Residency. On the contrary, near-peers in social media and other third parties as channels of communication can be seen constructing a network around e-Residency that positively influences the diffusion by responding to the needs of adopters and reducing notions of uncertainty.

The investigation contributes to entrepreneurship literature as the research concerned how a technological innovation can introduce a new method, a strategy of becoming an entrepreneur and/or to conduct cross-border business, and thus contribute to the reduction of spatial distances in global markets. E-Residency can be seen as enabling 'absent presence' for its adopters to practice e-entrepreneurship when establishing a location-independent, digitized business in Estonia. The notions of excitement and curiosity towards e-Residency were shaped by the perceived newness and the ideology of location-independent business practices, which the adopters found compatible with their prior needs. Besides of the technology itself, the perceived flexibility, time efficiency and the external environmental context of Estonia for businesses were identified to be positively involved to the adoption. Furthermore, the adoption of e-Residency for entrepreneurial purposes can be seen illustrating

how entrepreneurs can potentially benefit from a legal and technological environment of a foreign country. The potentiality of e-Residency to spur for entrepreneurship is an interesting aspect of the study. It can be seen as an opportunity to learn as well as to carry out business ideas. The straightforwardness of the application procedure together with the combination of perceived advantages can be suspected to reduce inhibitors of trying out a business idea.

## 7.1. Limitations and further research

A drawback of the outlined methodology is the challenge to draw generalizations based on the results due to the qualitative nature of the study as well as the fact that the e-Residency project has been ongoing since the time the informants obtained the innovation. Due to the richness of data collected for the study and a rather broad scope of the object of study, a variation of different matters and elements were discussed, although it can be seen as a scratch of the surface. The topic of e-Residency has a great potential for further research. The discussion on perceived motivators of e-Residency included environmental and technological aspects, which suggest a topic for further research. This study neglected these contextual perspectives due to the chosen conceptual model. Therefore, a natural extension for further study could be the application of Tornatzky and Fleischer's framework of technology-organization-environment (TOE). Such a research could have the potentiality to contribute in generating understanding of the dynamic networks of the online and offline environments intertwined to entrepreneurial activity of an e-Resident.

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## NEW PERSPECTIVES IN PUBLIC SERVICE INNOVATION

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### Abstract:

The paper aims to identify the building blocks of a new way of conceptualising and measuring public service innovation. The ultimate purpose is to contribute to the current debate on the role of public administrations and services in the competitive dynamics of countries, regions and local systems. Abandoning a pure subject based approach poses important challenges to measurement and statistics. A possible way to tackle such challenges might be that of singling out a manageable variety of public services and of innovation types, including online services. This implies reversing the usual approach: from the identification of subjects as the key unit of observation leading to classify innovative activities correspondingly; to the identification of innovative objects leading to the identification of subjects involved in the generation and diffusion of such innovative objects.

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## 1. Introduction

In the following pages, the authors aim to identify the building blocks of a new way of conceptualising and measuring public service innovation. The ultimate purpose is to contribute to the current debate on the role of public administrations and services in the competitive dynamics of countries, regions and local systems. It is suggested that addressing public service innovation implies that a large number of heterogeneous players and of interactions among them is to be considered, hence making it particularly hard to identify a single (or a few) “representative subjects” as units of analysis.

Abandoning a pure subject based approach poses important challenges to measurement and statistics. A possible way to tackle such challenges might be that of singling out a manageable variety of public services and of innovation types, including online services. Hence the case is made for an “object based approach” to public service innovation implying a greater emphasis on changes in service characteristics and in the objectives they pursue. This implies reversing the usual approach: from the identification of subjects as the key unit of observation leading to classify innovative activities correspondingly; to the identification of innovative objects leading to the identification of subjects involved in the generation and diffusion of such innovative objects.

Insights will be drawn from previous empirical work, based on case studies, surveys, official statistics and data-mining. Actual and potential developments of data collection through manual web surfing and semi-automatic web scraping will also be considered.

## 2. Theoretical and conceptual literature on public innovation

Public innovation has been addressed by a rather extensive number of very heterogeneous contributions encompassing different disciplines, objects and approaches. This literature ranges from analyses of regulatory changes, to studies on the evolution of governance modes, on the diffusion of new technology within Public Administration, and on new service adoption and development. Nevertheless, concentrating our attention on *public service* innovations, which are at the core of our analysis, makes our effort to review the literature more focused and manageable. When dealing with public service innovation, the starting point is the acknowledgement in extant literature that most innovation literature has developed with reference to technical change in manufacturing processes and has long disregarded innovation in services. Even more importantly, if innovation in services is the Cinderella of innovation litera-

ture, innovation in public services is the Cinderella of the literature on service innovation (Miles 1998).

Various differences and peculiarities were highlighted in the economic literature when moving the focus of analysis of innovation processes and results from production in manufacturing sectors to the service sectors. An even more relevant set of observations concerns the distinction between the dynamics observed in the private service sectors and in the public service composite and diversified world. A synthetic picture of similarities and divergences provided in the following chart:

#### **Similarities**

- Various phases and components of the innovation process which are both distinct and strongly interconnected
- Non linearity of innovation process
- Both promoter and user are involved and play key roles
- Contextual factors condition innovation all along its development

#### **Divergences**

- No market
- Price factor is not a quality indicator
- Objectives and strategies significantly differ from the ones in business sectors

This focus on innovation in public services is induced by a number of considerations that have been highlighted in the literature: the relevance of public services as a component of overall public sector activities and their effects on the economy and society as a whole; the impact on public services coming from the development of network technologies and applications; the growing interaction between public service providers and users.

A now rather extensive number of contributions have highlighted that public service innovation is conceptually different from manufacturing innovation, and that both similarities and differences also exist in comparison with business service innovation. **Similarities** include: the variety and interconnectedness of innovation phases, the non linearity of innovation process; the key role played by users; the conditioning role of contextual factors. The main **differences** have to do with the absence of selection mechanisms that are usually put in place by market forces; the fact that prices do not represent a good quality indicator; the variety of objectives and incentive structures characterising public service innovation. While no individual contribution gives account of all specificities and complexities of public service innovation, some comprehensive review works have guided us in exploring the main streams of literature and to identify key issues (Gallouj and Zanfei 2013; Djellal, Gallouj and Miles 2013; Kankanhalli, Zuiderwijk and Tayi, 2017).

Adapting a classification scheme that has emerged in the business service literature, it has been suggested that extant contributions on public service innovation can be classified into four main strands: **Assimilation** approaches, focusing on the adoption of new technologies in shaping innovation in services; **Demarcation or differentiation** perspectives, which emphasise that service sector evolution may follow heterogeneous patterns largely independent of technical change occurring in manufacturing



industries; ***Inversion*** approaches, which see (some) service industries as being sources of innovation across the whole economy, mobilising their suppliers, or providing inputs to innovation among their clients; and the ***integrative*** perspective, which emphasises that the boundaries between sectors tend to become more blurred and that forces are at work leading to the “servitisation” of the whole economy.

Several issues remain as ***open research questions*** to be analysed more in depth, including the challenges posed by data generation, the criteria for measuring qualitative aspects, the attention to be devoted to public value destruction, to mention just a few. Let us start with a brief discussion of some streams of literature that help identifying the key issues at stake.

### 3. Key streams of literature on public service innovation

Two main streams of literature appear to have set the key issues to be dealt with in public service innovation: the literature on ***public service dominant logic***, with its emphasis on the relevant stimulating and guiding impact of services in the development and innovation dynamics of the economy in general; and the literature on ***value creation and co-creation***, which has the merit of defining the concept of public value and the loci and mechanisms of its creation. These strands of contributions are of particular interest for the purposes of this study as they help to tackle two key issues in public innovation. The public service dominant literature provides some useful insights on the main *object* of analysis that needs to be focused upon when dealing with public innovation, that is public services. The value creation and co-creation perspective offers a set of concepts and analytical tools for the analysis of *process* through which public service innovation is generated and on the actual *output* of such generation process.

#### 3.1 The literature on public service dominant logic

The idea of *public service dominant logic* put forth by Bason (2010) and Osborne (2010) is that services play the most central role in the Public Sector, hence leading to abandon a product-dominant approach that has prevailed in most economics of innovation literature. The basic unit of analysis when dealing with public innovation should thus be public services.

The Service Dominant Logic elaborated by Vargo and Lusch (2006), is based on the proposition that organizations, markets, and society are fundamentally concerned with exchange of services — applications of competences (knowledge and skills) for the benefit of a party. From this perspective, services are basically exchanged against other services; all firms end up being service firms; all markets are centred on the exchange of service, and all economies and societies are service based. Service Dominant logic embraces concepts of the value-in-use and co-creation of value rather than the value-in-exchange and embedded-value concepts that are central in Goods Dominant logic.

Some of the fundamental premises were enriched or re-formulated in Vargo and Lusch (2008, 7): “*Service is the fundamental basis of exchange, (...) The customer is always a co-creator of value, The enterprise cannot deliver value, but only offer value*

*propositions. A service-centered view is inherently customer oriented and relational, all social and economic actors are resource integrators, and value is always uniquely and phenomenologically determined by the beneficiary”.*

The Service Dominant Logic extended to the public sector is analysed by Osborne, Radnor and Nasi (2013) looking at the intersection of value creation and value co-creation.

Osborne, Radnor and Nasi (2013) argue that *“public management theory is not fit for the purpose, because it focuses on intra-organisational processes rather than on the inter-organisational ones which are the reality of public service delivery, and is too much based on the manufacturing sector managerial theory. This is why the work argues for a ‘public service dominant’ approach, drawing upon service-dominant theory. This in the era of the New Public Governance”*

“The New Public Governance”, as an alleged new paradigm of public administration science, emphasized pluralism, attached great importance to the links between internal and external organizations, and paid attention to organizational governance. “The New Public Governance” paradigm had different names, such as “the New Public Governance” (Osborne, 2006), “New Governance” (Rhodes, 1996), and “Public Governance” (Skelcher, 2005) etc., cited in XU, SUN and SI (2015).

Bason (2010) emphasised the ‘four Cs’ in the public sector innovation and the ability to create ideas, implement them and create value for citizens and society: Consciousness, Capacity, Co-creation and Courage. These dimensions are strongly rooted in the subject/process side of public service innovation, deeply based on a concrete managerial experience in the public sector enhanced with a strong academic refinement of the practical work. The combination and reciprocal support of these two components of Bason’s experience brought him to elaborate a human-centred governance and to attribute/recognise a critical role to design in public service innovation. (Bason 2017)

A possible extension could be to focus on the so called **“General-interest services”**, i.e. services considered to be in the general interest by the public authorities and accordingly subjected to specific public-service obligations. They include non-market services (e.g. compulsory education, social protection), obligations of the State (e.g. security and justice) and services of general economic interest (e.g. transport, energy and communications) (EC 2011)

It would be misleading to consider such activities as “products” or even “public goods”. In fact public services are largely (albeit not exclusively) intangible in nature, are characterised by important complexities of innovation processes, and by a wide variety of the organisational resources and skills involved. As suggested by Osborne, Radnor and Nasi (2013 p.149), adopting a public service-dominant approach has four important implications: (1) the acknowledgement that both the citizen and user are essential to public service delivery processes and their engagement in these processes adds value to both; (2) Public Sector organisations are increasingly involved in shaping the expectations by their users hence affecting the role of the latter in innovation activities; (3) coproduction becomes an inalienable component of public services delivery; (4) new managerial skills and organisational capabilities are needed to make service provision effective.

Design emerges as one of the approaches which “*can contribute in powerful ways to innovation in the public sector and, potentially, transform how public organisations are governed*” (Bason 2017).

Public service design can be one of the areas of activity and of cooperation between public service providers and beneficiaries/users bridging the two streams of literature, as it stems from the public service specific domain but it can be also analysed for its co-creation content.

### **3.2 The literature on ‘value creation and co-creation’**

This literature tackles the key issue of *innovation output*, and of the *process* of its generation. An emphasis on value creation and co-creation is present in both business service innovation and public service innovation contributions. However value creation, considered in a wide sense, poses relatively less conceptual and measurement problems in the case of the Private Sector than in the case of Public Sector. In fact, in the private sector product and process innovation may be thought of as leading to greater value in terms of additional turnover, revenues, and profits; while changes in organizational practices can reasonably lead to increases in productivity. Shifting to the analysis of value creation in the public sector poses serious challenges in this respect. Reference will be made to attempts to measure value creation via performance indicators in the public sectors (see inter alia the review on ways to measure performance in the Public Administration conducted in Seri and Zanfei, 2013).

A wider concept of public value is not strictly related to the public sector performance but rather refers to the benefits accruing to the community or values generated by the reduction of negative externalities.

Moore (1995) contends that in the public sector the arbiter of value is not the individual, but the collectivity – that is society in general, acting he says “through the instrumentality of representative government” – and likely to be made up of service users, tax payers, service providers, elected officials, treasury and media. The issue of who is entitled to evaluate public value creation is left unresolved.

Moore (2012) – building on his *Creating Public Value* book - proposes a value chain for public administration, and indicates possible points of measurement in a scheme which includes inputs to organisational production process, and outputs to client encounters and social outcomes.

The development and use of some kind of accounting scheme is needed, in order to capture – or, in the accounting sense, recognize – when significant costs to the society were being incurred, and substantial benefits in the society being produced. (Moore, 2012, 2)

There have been several attempts to develop such a scheme based on a variety of philosophical approaches.

Moore (2013, 11), proposed a different path for future development of measures with the aims of: “1) reliably capturing the public value being produced by a government enterprise; 2) meeting public demands for accountability in government; and 3) helping managers to use performance measurement systems to guide their organizations

towards improved performance”.

Based on this general framework, Fuglsang and Rønning (2015) analyse the relation between public service innovation and public value. Values can be defined as measures for beneficial behaviour that guide innovation. Value-tensions in public services include tensions between the political, economic, communal, aesthetic and intellectual values. They point to the concept of intertwined innovation patterns, such as the intertwinement of *science-driven and task-driven innovation*, and to how *varied values* guide innovation in public services.

Elias (2016) highlights the contribution in the public service value debate of both Benington and Seddon who “focus on the need to identify purpose as a prime initial task in service improvement, rather than go down the customer/value route. Identifying purpose appears to have strong resonance with public value.” (p.9). Elias claims that “Indeed, public value is often at odds with private value.” (p.14)

#### 4. The building blocks of public service innovation

The path followed through the literature brings us to isolate a few **building blocks** for advancing in a more structured way in the public service innovation study and measurement. We suggest that addressing public service innovation necessarily implies (a) the **identification of specific public service innovation categories or types** as measurable “objects of analysis”; (b) coping with the **plurality of subjects** involved in public service innovation and with the variety of **aims** pursued through public service innovation; (c) the acknowledgement of the **open innovation** nature of innovation in public services and of the active role of **users/beneficiaries** in innovation processes; and (d) the need to adopt an **object based approach** to the measurement of innovation –given the extreme variety of subjects involved in public service innovation – and to select the key subjects (Public Sector organisations) according to the public service innovation categories under observation.

Let us briefly discuss each of these building blocks.

- **A clear identification of the object.** As mentioned earlier, there are sound elements to motivate a focus on **Public Service Innovation** as the object of analysis and measurement. A tentative definition of such innovation object could be: “Implementation of new or improved general interest services (as defined in the EU glossary and recalled above), with the aim of generating or redistributing wealth (in the sense of welfare) in a given society”. However, once the broad public service innovation domain is identified, one needs to account for a relatively high heterogeneity of service typologies and of aims pursued through their development and provision (more on this below).
- **A plurality of subjects.** There is an extreme variety of public organisation dealing with different categories of public services and across countries and regions for any given service typology. Such a variety reflects institutional differences stemming from national and sub-national formal and informal ways of ruling and governing public sector activities. Moreover, in a number of circumstances, both public and private players tend to be involved in the provision of (new or improved) services of public interests. The analysis of public service innovation should include innovations in general interest services not involving

“public entities” strictly defined such as independent organisations and mixed entities often identified with PPPs. This inclusion of spurious entities further expands the heterogeneity of actors to be considered when dealing with public service innovation.

- An **open innovation** approach<sup>1</sup> is needed. Openness implies vertical (upstream and downstream) linkages as well as horizontal knowledge exchanges and innovation flows. When the public administration develops a new service or becomes owner of a new knowledge, it has a direct interest in expanding the access to such services, and in circulating and diffusing this knowledge, thus paving the way to open innovation. Additionally, changes in hierarchical organization of public administrations, and trends towards networked governance modes further reinforce the adoption of open innovation approaches (see Kankanhalli, Zuiderwijk and Tayi, 2017, and the whole special issue devoted to open innovation in the public sector published in *Government Information Quarterly* n.34/2017). Broadly speaking, Open Innovation “encompasses different cooperative models that are more or less sophisticated and formalised. This includes unplanned or emerging models such as the rapid application model, the practice-based model, “*bricolage*” innovation and ad hoc innovation.” (Djellal et al., 2013, 113)
- **A consideration of the active role of the users/beneficiaries** of the public services. The participation and involvement of users/beneficiaries of the public services in the production of the service can be considered an innovation in itself. Users/beneficiaries may even directly contribute to the development of the public service innovation. A large variety of cases has been documented with reference to user-PA cooperation and user involvement at the local level, through user Associations, Living Labs, and SmartCity communities.
- **A variety of Public service innovation types and aims** needs to be considered. Public service innovation may be targeted to a large variety of potential beneficiaries, including individuals, households, business enterprises, communities. Extant literature has underlined the substantial heterogeneity of aims and motives of innovation in the public sector *vis à vis* innovation in the business sector that is, generally speaking, profit-driven. The heterogeneity of aims and motives of public service innovation has important implications for the development, diffusion, adoption and ‘commercialization’ of public service innovation. Aims may change according to targets and to the general policies adopted by governmental entities at all levels. One might need to define the turning point when the service innovation becomes a change in general policy. New/transformed services are also based on aims selected by public managers in line with politicians and closely related to the acceptance and recognition of public values. Local communities can play a key role in this process. In fact, local communities do not only affect public innovation by exerting their demand for new services and for a higher accountability. They can heavily influence decisions on what should (or should not) be provided through the public purse and can affect the balance between central and local priorities for all

<sup>1</sup> Open Innovation, a term introduced by Chesbrough (2003), evolved into an approach which goes beyond just using external sources of innovation such as customers, suppliers, rival companies, and academic institutions, and can be as much a change in the use, management, and employment of intellectual property as it is in the technical and research driven generation of intellectual property.

providers of services (the police, local authorities, schools and so on) to a particular locality.’ (Blaug, 2006, 7)

- **A subject based approach is less feasible in the case of Public innovation** than in the case of private sector innovation due to the relatively higher heterogeneity of actors involved both within and across the boundaries of Public sector. This is one of the outcomes of the criticism made of the assimilation approach (see above), which poses important challenges to measurement and statistics. A possible way to tackle such challenges might be that of singling out a manageable variety of public services and of innovation types, to explore different sets of actors and aims involved in each of them..
- Having said this on the limitations of a pure subject based approach, it remains that **key public innovators (subjects) need to be identified**, and in some cases they need to be different **according to public service innovation categories** that are analysed:
  1. public institutions at the level of country, region, city maintain their importance as observation units; we will need to develop indicators allowing to measure to what extent a given phenomenon concerns certain institutions (e.g, a given percentage of public hospitals are involved in the diffusion of a new service);
  2. the role of individual public institutions will need be identified for specific phases of Public service innovation. This might be particularly the case of service design and delivery, and of the specific contribution of Public organisations in the (co) development of services. In this respect, we should probably consider the role of service design as distinct from R&D activities and R&D expenditure.

## A focus on Open innovation

The de-centralized and un-directed form of innovation, referred to as “open innovation”, is gaining traction both in the private and public sectors. (Kankanhalli et al., 2017).<sup>2</sup> Out of several experiences put in place around the world, a special attention has been given to the ‘Open Government Initiative’ (Obama, 2009, 2012), allowing members of the public to access government data, and contribute ideas and expertise to government policy making and services innovation (Lee, Hwang, & Choi, 2012). See also De Publieke Zaak ([www.depubliekezaak.nl](http://www.depubliekezaak.nl)) with specific reference to the Netherlands, which reports a combination of projects inducing government agencies to innovate using insights from citizens. Public sector organizations are mostly in the early stages of adoption of open innovation (Ham, Lee, Kim, & Choi, 2015). Particularly, open innovation in the public sector requires governments to listen more to their citizens than they did before, and to involve users of public services more. However, the means and methods for citizen involvement in public sector innovation are still not mature (Bekkers, Tummers, & Voorberg, 2013). Furthermore, there is a lack of understanding of how open innovation strategies should be formu-

<sup>2</sup> All the cited authors in this paragraph come from Kankanhalli et al., 2017, so they are not included in our references.

lated in public sector organizations (Christos et al., 2013). Differences in terms of its focus, aim, value and external stakeholders, between private and public sectors are identified as relevant by Kankanhalli et al., 2017.

The relevance of open innovation in the public sector also has to do with the fact that it could lead to an improved awareness of social problems, more effective services deriving from broad citizen inputs, and increased trust between governments and citizens (Mergel & Desouza, 2013).

Moreover, open innovation “involves the generation of public value (Bommert, 2010)” and “must be researched in its own right. (...) researchers (e.g., Criado, Sandoval-Almazan, & Gil-Garcia, 2013) have also highlighted the important role of information technology (IT) to generate and deliver innovative public services.” Kankanhalli et al., 2017, 84)

Finally “opening up” government implies that public sector organizations have started efforts to leverage IT for making raw data and records available, mostly with machine-readable interfaces, so as to facilitate open innovation through open data initiatives (Zuiderwijk & Janssen, 2014). This poses several challenges (Attard, Orlandi, Scerri, & Auer, 2015; Pardo & Tayi, 2007). Agencies have to identify data sets that could be potentially valuable to user communities. This requires developing internal mechanisms that could be used to vet and process data sets by all relevant parties within the agency before release. Next, steps have to be taken to assure that the data sets being released are technically accurate as well as interpretable (Ham et al., 2015). The data sets may have to be masked (in some instances) to ensure that privacy requirements are satisfied, while issues concerning legal liability are covered. For ongoing effectiveness of their open data initiatives, agencies may need to develop feedback mechanisms and measures to assess how the released data have been used by different stakeholders and the value, both economic and social, such use has generated (Zuiderwijk & Janssen, 2014). Indeed, while the use of IT has helped to support the shift towards more open and collaborative innovation practices in the public sector, this also spurs a need for robust (theoretically-grounded, empirically validated) research on the challenges and effectiveness of its use” (Kankanhalli et al., 2017, 85)

Reviewing literature wide range of contributions on open innovation in the public sector, Kankanhalli et al., 2017 point out that most examples analysed in extant literature concern local authorities and cities, so they suggest to devote research efforts to domain-specific analyses. Areas deserving focused attention in the near future are: healthcare, education, transportation, energy and environmental protection, e-democracy and e-participation, safety and justice. (Kankanhalli et al., 2017, 86-87). Also other technological mechanisms for open innovation such as open data platforms (Yang & Kankanhalli, 2013; Zuiderwijk & Janssen, 2014) e.g., for building analytics solutions, and delivering services via smartphones, also warrant further research.

## 5. Sectoral cases and thematic aspects

The general considerations we have just developed on public service innovation are taken into account skimming through the literature concerning two specific sectoral

domains: Environmental protection and Health care. Moreover a focus is provided on studies that have used web based metrics to explore public service innovation.

## 5.1 Environmental protection services

Environmental protection has peculiar structural characteristics. First, public services that contribute to environmental protection are often aimed at imposing constraints to the damaging activity carried out by some groups of agents (i.e. the polluter) to benefit other different agents (i.e. the pollutee). Second, the public nature of environmental goods generates difficulties in financing the provision of public services that improve environmental protection and consequently reduces the 'returns' for the public innovator.

In the existing literature, there is no comprehensive assessment of public service innovation for environmental protection. Several case studies on specific innovation in specific sectors, however, can be found, especially so for innovation in the way the services of waste management and wastewater treatment are provided. The substantial **heterogeneity** of activities within the environmental protection sectors results in a specific focus on technological innovation in some subsectors (e.g. wastewater treatment) and a focus on non-technological innovation for other sub-sectors (e.g. waste management).

A few recent programs and projects carried out by national and international agencies (EIONET, EEA, OECD-IEA, ISPRA) could be useful sources of information for identifying **good practices** often paving the way to public service innovations. It should be noted that these programs and projects are not explicitly aimed at the collection of PSI data but rather focus on providing comprehensive information on policies and measures for promoting environmental protection. Policies and measures at various levels might be seen themselves as public service innovation as they contribute to the 'service provision' of improved environmental quality.

How should the **building blocks** identified in the general public service innovation literature be reconsidered when analysing (and measuring) public innovation in environmental protection?

*Object:* it is often (e.g. in the papers that evaluate innovation in the waste management sector) the regulation in itself that is introducing the innovation in public service provision.

*Subjects:* both representative bodies (parliaments, regional assemblies, municipal councils) and administrative bodies play a role in the introduction and successful development and adoption of the innovation.

*Open innovation:* Due to the involvement of different actors at various levels of government, open innovation has the potential of playing an important role in determining the success of public service innovations for environmental protection. However, not explicitly treated in most contributions.

*Users and beneficiaries:* they are important actors both in terms of pressure groups to demand innovative solutions for environmental problems and, more importantly, as active agents in the delivery of the public service. Their role is often emphasized in the.



*Aims:* Besides the general aim of improving environmental quality, public service innovations are directed at improving the both the effectiveness and the efficiency of actors involved. Efficiency here is particularly important, as the public sector needs to consider both the cost of implementing the innovation for the public budget and the costs imposed on other agents (i.e. the polluters) by the regulation.

## 5.2 Healthcare services

A recent review on PSI reports that 14% of studies surveyed are related to PSI in Health, although many refer to the UK National Health Service (NHS) activity (De Vries et al., 2016). Moreover, studies are mostly based on anecdotal information rather than a systematic view of the phenomenon.

The management of healthcare data – via electronic devices, that are becoming more and more relevant, like smartphones, smart watches or other devices dedicated to specific diagnostics – is at the core of PSI in Health.

There are **specificities** in terms of actors involved in the innovative process. An example regards the University Hospitals. If they can be considered hospitals like all the others, meaning that their aim is to deal with patients' Healthcare, they are also highly involved in research. The existence in these hospitals of researchers implies a more active role of university hospitals in managing the information gathered for a more general purpose.

There are indeed two faces of PSI in health: On the one side, Health institutions have been involved, among others, in more general analyses on PSI. This happens because Health is still one of the main items of public budgets worldwide. On the other side, a relatively large share of these studies has been conducted on the implementation of Health services by means of ICT.

Some **stylised facts** highlighted in the literature include the following: (a) “there is a large literature on innovation in Healthcare, but most of it focuses on Healthcare technologies” (Arundel et al., 2016); (b) “having an eHealth strategy is now becoming the norm” (WHO, 2016); (c) “user involvement is an important part of Health innovation and public private collaboration” (Norden, 2011); (d) “inter-relatedness of European countries (in terms of innovation in health, thus giving rise to) the opportunity for collaboration to achieve benefits for all citizens” (EUPHA-PHIRE, 2010); (e) “despite the recommendations of the Atkinson report, only a few countries have started to produce volume measurements of government and Healthcare outputs” (Misuraca et al., 2013)

How should the **building blocks** identified in the general public service innovation literature be reconsidered when analysing (and measuring) public innovation in healthcare?

*Object:* it varies substantially across projects launched to face specific challenges, ranging from very specific tools such as an app for smartphones and other devices (e.g. smart watches) used to reward improvements in lifestyle, to the achievement of specific micro-changes in people everyday lifestyle. In some circumstances, the creation of a new hospital or even a partnership between private hospital and a public administrative body leading to organisational changes could be the innovative “ob-

ject” at stake, thus creating some confusion between object and subject of innovative activities.

*Subject:* several partners, including public institutions and organizations, are involved in most innovative activities under examination.

*Open innovation:* most often used as an approach to PSI in health, with a clear emphasis on the active role of users. People are induced to actively share the information about their lifestyle in order to get rewards in the Carrot project; joint healthcare initiatives are used to simplify patient contacts with health system in the case of Future Plan for Stockholm; an interactive, integrated, web-based platform for facilitating timely detection and treatment of patients with heart disease and an ICD in a multi-centre randomised study is at work in the Patient@home framework.

*Aims:* The general purpose of improving public health is connected to more practical aims, such as the one of gathering info on people’s lifestyle or motivating patients to take care of their own health.

### 5.3 Using web metrics to explore public service innovation

The starting point is a selection of nine pilot studies assessing the feasibility of data mining so called “digital footprints” that organisations and individuals leave behind on the internet to describe socio-economic phenomena (Brennenraedts et al, 2008). These include: case studies using user centric measurements that capture changes in behaviour at the client (PC, smartphone) of an individual user; Network-centric measurements that focus on measuring properties of the underlying network; Site-centric measurements that obtain data from web servers. The latter have marked the most promising research path and in one case of nine recorded they have focused on public sector.

The **objects of observation** in site-centric measurements are web pages on the public internet. These are the front-end of e-government. The back-office of e-government is outside the scope of site centric measurements. This implies disregarding innovations in the information architecture of governments that might be achieved by a reorganisation of the back-office (OECD, 2005).

When the syntax of a computer code is analysed indicators can be derived about the nature of the web technology that is being used. The sophistication of the technology can be considered as a proxy for the innovativeness of the organisation utilising that technology. When we analyse the semantics of texts in a web page we use the meaning of the content to derive statements about the status or activities of the organisation.

The interpretation of semantic texts, which is still a major challenge for automated agents, can be greatly improved by enriching key words with meta-data based in their position (i.e., whether it is part of a [sub]title) or particular functionalities (i.e., whether it is included in a hyperlink).

Examples of **indicators** and of their use to explore public service innovation include: (a) The frequency of specific keywords in a website (e.g., ‘Research’ AND ‘development’) can be used to map R&D activity of firms (Gök et al, 2015); (b) a correlation seems to exist between the frequency in which a website is being updated, and the

growth of a company (Dataprovider, 2017; te Velde and Lelie, 2017); (c) An increased rate in the frequency of updates of government websites might thus indeed be a (weak) indication for a surge in activities, and especially in innovation activities; (d) The speed at which web pages are downloaded and displayed in the browser (web performance) is a decisive variable in user experience. Poor web performance is an indicator of underinvestment in the back-end infrastructure and especially in the quality of the computer code; (e) The presence in a given website of specific modules (e.g., payment modules) or components (e.g., state of the art web technologies) can be indicators of the performance of the public sector organization that is responsible of that website. This measure cannot distinguish across individual services provided, as the same infrastructure can be used for different services; and is affected by the fact that the development of the most sophisticated modules may be heavily dependent on the behaviour of end users; (f) The presence in the semantic of a given website of (a shortlist of) keywords can be used to trace persons (Bakhshi and Mateos-Garcia, 2016) or firms and map collaboration networks between them. (Bakhshi et al, 2015; Vankan et al, 2014). Another application is the detection of specific topics in official (city council) minutes to monitor the implementation of new national legislation (Schut et al, 2017).

Keywords can also be generated bottom up along the way (ex post generation), instead of being known beforehand (i.e. ex ante, top down defined). This always involves an automatic transformation of natural language (the texts on the web pages) to some semantic normal form (Lie et al, 1998). Ex post semantic searches can be applied to a wide area of relevant topics, such as the mapping of upcoming scientific fields, technologies (van der Lei and Cunningham, 2006), industries (Shapira et al, 2016), innovation strategies (Youtie et al, 2012; Beaudry et al, 2016), jobs (Jager, et al, 2014), skills (Jager and Vankan, 2015) and digital skills in particular (such as 'computational skills' or 'data analyses'). These skills are also increasingly demanded outside the core IT sector, and the public sector is no exception to that (Bovens and Zouridis, 2002).

The structure of a website can be analysed to effectively and efficiently trace the most relevant semantic parts on a page. This method has been used to automatically retrieve massive amounts of both qualitative and quantitative data on corporate social responsibility from the internet (WikiRate project CERTH); to collect price information on various specific products and services (Hoekstra et al, 2010); and to assess the quality of the website and the online services in e-government (Brennenraedts and te Velde, 2012).

## 6. Concluding remarks

In this paper we suggested that public service innovation implies a large number of heterogeneous players and of interactions among them, hence making it particularly hard to identify a single (or a few) "representative subjects" as units of analysis. Abandoning a pure subject based approach – which has long dominated in most statistical efforts to measure innovative activities - poses important challenges to empirical research. A possible way to tackle such challenges might be that of singling out a manageable variety of public services and of innovation types, including online services. Hence the case is made for an "object based approach" to public service innovation implying a greater emphasis on changes in service characteristics and in the

objectives they pursue. This implies an in-depth criticism and even a reversal of the usual approach to innovation measurement.

The traditional way of measuring innovation starts from the identification of subjects as the key unit of observation and leads to a simplified assessment of how such subjects differ in terms of standard innovative activities. This approach has its own merits as it draws data from a clear point of observation, that is a set of players that are recognisable in the real world, as it is the case of small, medium and large size enterprises in private sector innovation. There are of course differences in the relative importance of such firm characteristics – summarised by their size - across different business sectors; and some of the standard innovative activities – e.g. product, process, organisational innovation - can hardly be characterised in the same way in different industries, especially if business services are included and juxtaposed to manufacturing industries. However, the distinction in terms of firm size still holds as it captures differences in terms of efficiency and of the ability to pursue the main objective of business oriented activities, that is profit.

By contrast, the extreme variety of hardly comparable subjects needs to be acknowledged both within and across different branches of the public sector; as well as across and within countries for any given branch of public sector activity. This high degree of heterogeneity of public (or semi-public) players reflects the variety of historically driven institutional differences, and the enormous differences in aims pursued through the development of public services. The point we want to make is that this heterogeneity – of players and of their aims - undermines any attempt to simplify measurement and empirical analysis by identifying a few key characteristics shared by all public sector subjects. It seems to us more appropriate to look at public service innovation the other way around: one should rather single out a manageable set of innovative “objects” – public service categories and typologies, often arisen to pursue specific aims of public interests - leading to the identification of subjects involved in the generation and diffusion of such innovative objects. Hence subjects will differ according to the types of innovative objects being considered. Among other merits, this approach leaves room to the consideration of a larger variety of subjects, including non public ones, mixed entities, PPPs and, last but not least, different categories of users which may play a key role in the co-creation of (new) public services. Hence, this approach is consistent with the increasing emphasis on open innovation that has emerged in the literature. An attempt to apply this “reversed” (object-based rather than subject-based) approach has been made with reference to two branches of public sector activities - health and environmental protection – offering some useful insights. Furthermore, the potential advantages of measuring at least part of public sector innovation by means of website centred techniques have been illustrated. We believe that this conceptualising and measuring public service innovation is a promising one and may open up new avenues of future research in this field.

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# PLATFORM CREATION AND DEVELOPMENT, A STRATEGIC AND NECESSARY VEHICLE FOR IOT PRODUCT AND IOT PROCESS

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*The study focuses on the development of the Internet of Things (IoT) in particular the role that platforms can play. It turns out that the IoT for its development needs four conditions to be met, namely an Internet connection, a common architecture, the flows of data and innovation dynamics. Now, platforms as networks offer an Internet connection, as architectures create a common architecture, as network effects facilitate the flows of data, and as open systems generate innovation dynamics. However, the different platforms that exist don't offer the same degree of openness. The development potential of IoT increases from firm platforms to industry platforms through supply-chain platforms and multisided market platforms.*

JEL classification :

*Keywords: Platform, Internet of Things, Industry, Firm, Network, Ecosystem.*

## 1. Introduction

More than 15 years ago, Ashton (2009) has introduced the term “Internet of Things” (IoT) in order to describe “the self-organized interconnectivity of uniquely identifiable everyday objects” (Gerpott and May, 2016) like cars, clothing, industry equipments, home appliances, health devices,.... Through different networks, these objects exchange data about their environment but also themselves thanks to communication technologies (Gubbi et al., 2013, pp. 1646-1647).

Firms for which connectivity, network and data are critical for their businesses are interested in IoT (Dlamini et al., 2009; Li et al., 2014a). Manufacturing firms continually develop automated operations systems becoming more information oriented and knowledge driven (Davenport and Short, 2003; Li et al., 2010). to be able to work in “distributed environments”, environments where items and systems are interconnected. Indeed, they have to integrate various network systems to be connected to the items and databases required for their activities (DaCosta, 2013; Kehoe and Boughton, 2001). Sharing data across multiple platforms contribute to

the development of “design anywhere, manufacture anywhere” (Kellmerein and Obodovski, 2013; Manenti, 2011).

Platforms are discussed in literature on IoT but, to our knowledge, it is not explained why and how platforms can be beneficial to the development of IoT while the number of connected ‘things’ will increase by 31% between 2016 and 2017 to reach 8.4 billion and is estimated to be 20.4 billion in 2020 (Gartner, 2017). Indeed, in order for firms to take advantage of IoT both in terms of products and services and processes, they must find the ground on which they can develop IoT.

The advantages granted by IoT are transparency, traceability, adaptability, scalability, and flexibility (Chui et al., 2010). by connecting industries to the computerized world (Mishra et al., 2016). The use of the IoT expands and changes firm’s product and service range to provide customers with additional benefits (Porter and Heppelmann, 2014; Gerpott and May, 2016) such as the Amazon dash button (Economist, 2015) or the home appliances (Balta-Ozkan et al., 2014).

Apart from value creation, IoT allows improving operational processes, reducing cost and minimizing risk (Chui et al., 2010). “Firms benefit of the exploitation of IoT technologies by both generating more revenues (via the commercialization of new products and services) and improving their productivity and cost savings.” (Ferretti and Schiavone, 2016). The study of platforms seems interesting since, like IoT, platforms link products and services and processes.

Besides, many authors have detailed the consequences of IoT for different domains such as Manufacturing, Logistics, Energy, Health, Automotive, and Insurance domains (Haller et al., 2009). but also Personal and Home, Enterprise, Utilities, and Mobile domains (Gubbi et al., 2013). or even Industry, Healthcare, Smart environments, and Personal and Social domains (Mishra et al., 2016) Moreover, these domains are more and more concerned by platforms, like consumer healthcare platforms, car platforms, connected home platforms, mobile application platforms,...

Taking into account all these aspects of IoT, firms need to determine how they can adopt IoT easily and efficiently, for their current and future businesses and markets (Miorandi et al., 2012).

The aim of this paper is to determine the role that platforms can play in the development of IoT. To understand why platforms are useful for the development of IoT, we first identify the conditions necessary for the development of IoT. These favorable conditions for the development of IoT must be reflected in the characteristics of the platforms. However, there are different platform types and not all of them are as favorable for the development of IoT, as their characteristics are moving away for IoT development conditions.

The paper’s main thesis is that platforms are favorable to the development of IoT because: (1) the network of the platform is favorable to the development of IoT by offering an Internet connection; (2) the architecture developed for the platform is favorable to the development of IoT by creating a common architecture; (3) the

network effects generated by the platform are favorable to the development of IoT by facilitating the flows of data; and (4) the openness of the platform is favorable to the development of IoT by generating innovation dynamics.

This article offers three main contributions. The first contribution is to identify the key conditions for the development of IoT. We demonstrate that an Internet connection, a common architecture, the flows of data and innovation dynamics are essential for the development of IoT. The second contribution is about the role that platforms can play for the development of IoT thanks to their network, their architecture, their network effects and their openness. We explain that these characteristics are in line with the conditions required for the development of IoT. The third contribution concerns the types of platforms that favor the development of IoT. We show that the degree of openness of the platform in terms of access to the connection to Internet, the common architecture, the flow of data and the innovation dynamics determines the IoT development potential. So the development potential of IoT increases from firm platforms to industry platforms through supply-chain platforms and multisided market platforms.

The rest of the paper is organized as follows. In Section 2, we identify the conditions required for the development of IoT. In Section 3, we analyze platforms characteristics to determine if they respect IoT development conditions. In Section 4, we establish the IoT development potential according to the type of platform. Section 5 concludes the paper.

## **2. The conditions for the development of IoT**

For the first time, Ashton has used the term IoT in 1999 to describe the emerging global internet-based information service architecture (Ashton, 2009). The IoT is presented as a “an emerging global, Internet-based information service architecture facilitating the exchange of goods in global supply chain networks [ ... ] on the technical basis of the present Domain Name System; drivers are private actors” (Weber, 2009).

For the IoT European Research Cluster (IERC), IoT is “an integrated part of Future Internet including existing and evolving Internet and network developments and could be conceptually defined as a dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols where physical and virtual “things” have identities, physical attributes, and virtual personalities, use intelligent interfaces, and are seamlessly integrated into the information network” (IERC, 2011).

Indeed, “the IoT occurs when the object-system is integrated into the internet space, allowing such an object to be constantly connected” (Caputo et al., 2016) in order to facilitate the interactions with each other and the flows of information. This networked interconnection of everyday objects and items (Xia et al., 2012). is supported by the presence of information sharing mechanisms (Li et al., 2012).

Through global platform and thanks to the use of IoT, machines and smart objects communicate, dialogue, compute, and coordinate (Miorandi et al., 2012).

For some practitioners, the IoT is evolving to the IoE, the Internet of Everything (Evans, 2012; Bradley et al., 2013) because the concept of IoT is limited to the things and should be extended to also people, process and data since the phenomenon observed “brings together people (humans), process (manages the way people, data, and things work together), data (rich information), and things (inanimate objects and devices) to make networked connections more relevant and valuable than ever before – turning information into actions that create new capabilities, richer experiences, and unprecedented economic opportunity for businesses, individuals, and countries ” (Evans, 2013).

The role of Internet is predominant and consubstantial to IoT. Moreover, the IoT contains the term Internet. The Internet connection is therefore indispensable to the development of IoT. However, there is a lack of studies concerning the role of the internet in manufacturing but also for IoT (Xia et al., 2012). since the internet role is principally focused on engineering aspects (Ashton, 2009; Gubbi et al., 2013; Guinard et al., 2010).

### ***Hypothesis 1: The development of IoT relies on an Internet connection.***

Mobile and fixed “Things” are constantly connected to the web in order to be read, recognized, located, addressed and controlled (Borgia, 2014). And all these data are used for the process from manufacturing to distribution (Yusuf et al., 2004). to improve the operating performance concerning cost, quality, flexibility and delivery (Devaraj and Kohli, 2003).

The technologies used for IoT are Radio Frequency Identification (RFID), Near Field Communications (NFC), Internet Protocol version 6 (IPv6), sensors, wireless communications, cloud computing, 3D virtual reality technology (Chao et al., 2007; Gubbi et al., 2013; Ilic et al., 2010). (Miorandi et al., 2012). This variety of technologies used in IoT requires a common architecture to be interoperable.

Besides, the “ S-E-N-S-E ” acronym summarizes the key attributes of these technologies (Goldman Sachs Global Investment Research, 2014):

- Sensing because they acquire senses via sensors;
- Efficient because they make processes intelligent;
- Networked because they are connected to the network;
- Specialized because they customize technologies and processes;
- Everywhere because they are accessible everywhere.

To take full advantage of these key attributes of things, they have to work together harmoniously through a common architecture. Indeed, IoT is “a dynamic global

network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols” (Vermesan et al., 2011). To integrate all these specific technologies, stakeholders need then to achieve interoperability at different levels (Gassmann et al., 2010; Lin et al., 2010; Rong et al., 2013c).

***Hypothesis 2: The development of IoT relies on a common architecture.***

There is a need to embed advanced technologies in products and production methods to generate data along the life cycle of products and production methods (Ashton, 2009; Devaraj et al., 2007; Fleisch, 2010; Kiritsis, 2011; Ventä, 2007). useful for workers, managers, systems and supply chains (Caputo et al., 2016). that also allow things to communicate with each other thanks to standard communication protocols and unique address (Atzori et al., 2010, 2012). Generating flows of data is the reason of the development of IoT.

The IoT technologies increase not only the complexity of interactions by connecting many stakeholders (Rong et al., 2015) but also the complexity of data by adding the self-produce dimension (Caputo et al., 2016).

The access to data is either done in real-time for immediate decision making by smart devices (Yam et al., 2005). to perform preprogrammed actions (Fleisch, 2010). or done later by a decision maker (McFarlane et al., 2003) to control or improve the product or the process thanks to a large quantity of high-quality and low-cost information (LaValle et al., 2013; McAfee and Brynjolfsson, 2012).

The data flows from interconnected objects produce value useful for the businesses. For firms, the objective is then to develop “a system that is capable of carrying out intelligent functions (such as detecting, sensing, recording, tracing, communicating, and applying scientific logic) to facilitate decision making to extend shelf life, enhance safety, improve quality, provide information, and warn about possible problems” (Yam et al., 2005, p. 2). It is therefore necessary to ensure the flow of data as much as possible for the development of IoT.

***Hypothesis 3: The development of IoT relies on the flows of data.***

IoT is a source of technology cross-fertilization (Calia et al., 2007; Björkdahl, 2009; Johnson and Suskewicz, 2009) because the integration of advanced technologies like IoT into the product or service generates interactions between different disciplines.

The IoT components can have three different roles: an enabler, an adjunct or a new product or service (Gerpott and May, 2016). The two first, an enabler and an adjunct, are complement elements of current offering portfolio. While the enabler is a simple added functionality of an already existing offering, the adjunct significantly expands the added functionality of the already existing offering. The third one, the

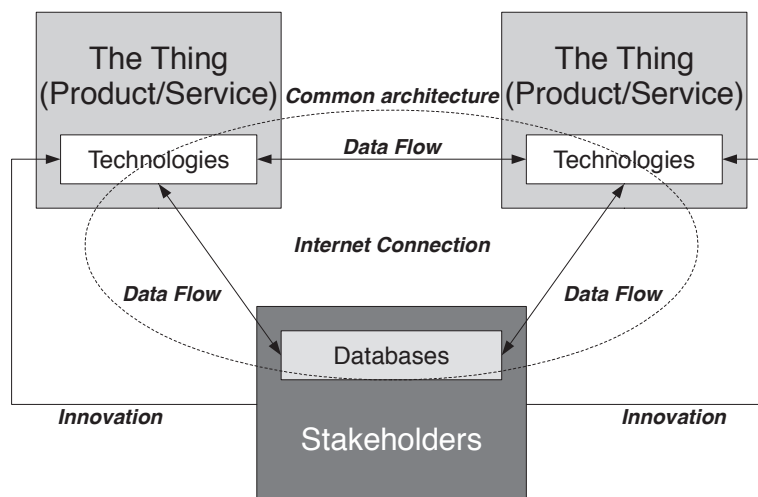
new product or service, generates a completely new offering. Indeed, without IoT components, the newly offered product or service will not exist.

The innovation dynamics are essential for the development of IoT because IoT is used to create complementary products and services. Moreover, the term “servitization” (Martinez et al., 2010). is associated to IoT (Gerpott and May, 2016). since products that integrate IoT technologies generate value thanks to complemented services.

**Hypothesis 4: The development of IoT relies on innovation dynamics.**

According to our analysis, the development of IoT relies on an Internet connection, a common architecture, the flows of data and innovation dynamics (Figure 1). Without these conditions, it is difficult for IoT to grow.

Fig. 1: The conditions for the development of IoT



Indeed, IoT depends to investment made by firms and if firms that invest are not sure to connect to Internet, to interact their things with other devices, to obtain data and innovate, they will see no or less interest in investing in IoT. So, to increase their incentives of investing in IoT, we will check if platforms meet these conditions necessary for the development of IoT.

### 3. The platform characteristics favorable to IoT

The analysis concerning the conditions for the development of IoT has identified the Internet connection, the common architecture, the flows of data and innovation dynamics as necessary. The objective is now to determine if platforms have the characteristics to provide an Internet connection, a common architecture, the flows of

data and innovation dynamics. Only in this case will be platforms a support for the development of IoT.

Internet has been described “as the physical communication system” and “the Web as all products and services that rely on this communication system” (Evans, 2011). That is why the platforms that are connected to Internet are called Web platforms (Evans, 2011) or presented as E-Hubs (Kaplan and Sawhney, 2000). Web platforms have developed a lot with well-known platforms like Amazon, Google or Facebook.

Another term has also emerged internet intermediaries (Caillaud and Jullien, 2003) or e-intermediaries (Yablonsky 2016b) to stress the importance of the connection to Internet for platform. OECD (OECD 2010) has indicated that “Internet intermediaries bring together or facilitate transactions between third parties on the Internet. They give access to, host, transmit and index content, products and services originated by third parties on the Internet, or provide Internet-based services to third parties. They offer access to a host of activities through both wired and wireless technologies”.

The connection to Internet is really important for platforms to grow fast and to reach a maximum of complementors and customers. In most studies concerning platforms, the role and impact of Internet is obvious for the rise of platform business.

***Hypothesis 5: The network of the platform is favorable to the development of IoT by offering an Internet connection.***

From the engineering design perspective, the platform is composed by subsystems and interfaces (Meyer and Lehnerd, 1997) to engender an architecture, a product platform (Ulrich, 1995) in order to facilitate the development of a stream of products or product families (Sanderson and Uzumeri, 1995; Meyer and Lehnerd, 1997; Muffato and Roveda, 2002). The common elements, components and subsystems, shared across a range of products constitute the platform (McGrath, 1995; Krishnan and Gupta, 2001).

Thus, platforms are viewed as modular systems (Baldwin and Clark, 2000; Baldwin and Woodard, 2009; Gawer and Henderson, 2007; Gawer, 2009, 2014; Schilling, 2000). that break up the whole system into subsystems by introducing standardized interfaces to facilitate innovation (Gawer, 2014; Langlois, 2002; Simon, 1962). There is a core that is common and stable, and a periphery that is diverse and changeable (Baldwin and Woodard, 2009). The role of interfaces is important for the platform architecture and development (Tiwana et al., 2010; Gawer, 2014).

The common architecture needed for the development of IoT benefits from the establishment of a platform. The platform allows having a core that is common and stable. And, in the same time, the platform facilitates the development of complementary products and services thanks to modularity and interfaces.

***Hypothesis 6: The architecture developed for the platform is favorable to the development of IoT by creating a common architecture.***

From the economics perspective, platforms are like “conduits” that stimulate exchange between many, at least two, categories of users (Evans, 2003; Rochet and Tirole, 2006; Rysman, 2009). that otherwise will not be able to transact (Gawer, 2014).

Concerning these multi-sided platforms, "network effects" indicate that the value of the platform for each affiliate depends on the total number of affiliates connected to this platform (Economides, 1996; Eisenmann et al., 2011, Farrell, & Saloner, 1985; Katz, & Shapiro, 1985; Evans, 2003; Rochet and Tirole, 2003, 2006; Armstrong, 2006). In the literature, the two main network effects are direct network effects and indirect network effects.

Direct (or same-side) network effects concern the same side of the network, and as the number of users increases, the benefit of the network for each user increases because of the possible number of interactions with the same side (Katz, & Shapiro, 1994; Arthur, 1989; Eisenmann, Parker, and Van Alstyne, 2006; Farrell and Saloner, 1985; Katz and Shapiro, 1986) like fixed line telephone.

Indirect network effects concern both sides of the network, and as the number of one side customer increases, the benefit of the network for each other side customer increases because of the possible number of interactions with the other side (Caillaud, & Jullien, 2003; Rochet, & Tirole, 2006; Rysman, 2009; Armstrong, 2006; Evans, 2003; Evans and Schmalensee, 2008; Parker and Van Alstyne, 2005; Rochet and Tirole, 2003).

There is a self-reinforcing feedback loop between users and providers (Rysman, 2009) because the provider platform value depends on the installed base of users and the user platform value depends on the variety of complementary products and services (Rochet, & Tirole, 2006; Roson, 2005; Evans, 2003; Rochet and Tirole, 2003).

So, if the installed base of users is large, the providers are encouraged to develop more complementary products and services, and if the complementary products and services are diverse, the installed base of users will enlarge (Cusumano and Gawer, 2002; Gupta, Jain, and Sawhney, 1999) .

The flows of data needed for the development of IoT benefit from direct and indirect network effects. The direct network effects act on the providers because the flow of data will be larger as the number of providers increases. There will be more interactions between their “things”. The indirect network effects favor the flows of data from customers to providers thanks to IoT, and in return, customers benefit from more varieties and adequate complementary products and services.

***Hypothesis 7: The network effects generated by the platform are favorable to the development of IoT by facilitating the flows of data.***



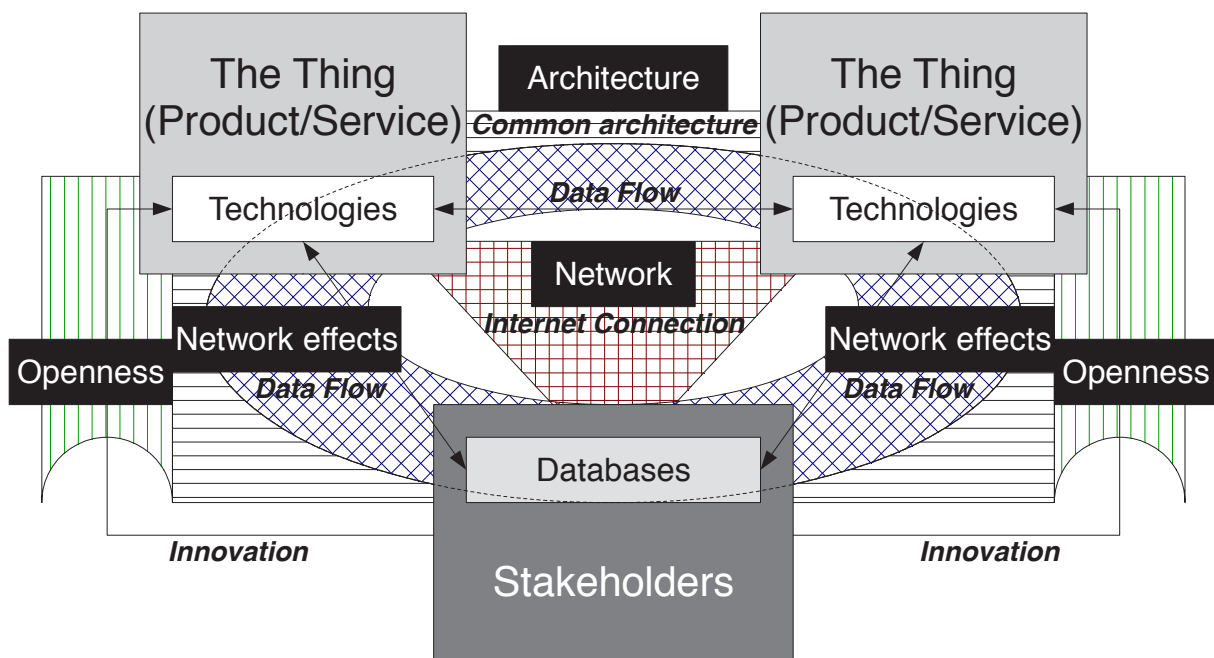
From the strategic management view, the platform is open if independent providers can contribute to the platform either with complementary components or by controlling the platform (Boudreau, 2010; Eisenmann et al., 2008; Rysman, 2009). Independent providers of complementary components accelerate the rate at which new devices appear and innovations occur (Boudreau, 2010).

However, this openness is necessary but not sufficient. It depends also on the platform features such as the quality of the product platform (Liebowitz and Margolis, 1994; McIntyre, 2011; Tellis, Yin, and Niraj, 2009; Zhu and Iansiti, 2012). The management of complements is thus critical for platform in order to provide users with a large set of complements (Gupta, Sawhney, and Jain, 1999; Gandai et al., 2000; Nair, Chintagunta, and Dubé, 2004; Clements and Ohashi, 2005; Kapoor and Lee, 2013; Cennamo and Santa, 2013).

The innovation dynamics needed for the development of IoT benefit from the openness of the platform. The independent providers can have access to the platform to offer complementary products and services or even sometimes control the platform. The openness of the platform allows the contribution of a large set of providers and so innovation.

**Hypothesis 8: The openness of the platform is favorable to the development of IoT by generating innovation dynamics.**

Fig. 2: The conditions for the development of IoT



From the engineering design perspective, the economics perspective and the strategic management view, platforms are characterized by their architecture, their network effects and their openness. All these three characteristics are beneficial to the IoT. Indeed, we have linked the architecture of the platform with the common architecture needed for IoT, the network effects with the flows of data and the

openness with the innovation dynamics (Figure 2). Besides, in platform theories, Internet plays an important role in the network which is beneficial to the IoT that needs an Internet connection (Figure 2).

However, not all platforms exhibit these specific characteristics at their maximum. Some does not propose an Internet connection; others have not a platform that is totally common; while networks effects are limited for different reasons, and openness for innovation is not a rule of the platform.

#### **4. The types of platform favorable to IoT**

Two predominant forms of platforms have been identified: internal or company-specific platforms, and external or industry-wide platforms (Gawer and Cusumano, 2014). Internal platforms include firm platforms and supply-chain platforms while external platforms comprise industry platform and multi-sided market platforms (Gawer and Cusumano, 2014). These different platforms respect more or less the different IoT development conditions (Table 1).

Internal or company-specific platforms (also named product platforms) serve as a common structure for a company to develop product families (Meyer and Lehnerd, 1997; Muffatto and Roveda, 2002) but it does not mean that they give a connection to Internet. They are more privately held platforms to prevent access to other firms. External or industry-wide platforms differ from the former by allowing external firms to develop complementary products or services (Gawer, 2009; Gawer and Cusumano, 2002) that is why they will logically propose to firms to connect via the Internet. They are more Web platforms to facilitate access to other firms.

Concerning internal platforms, “product platforms” have been developed to offer more adequate products to the different customers through product families (Wheelwright and Clark, 1992). Since platforms are presented as a set of assets (i.e., components, processes, knowledge, people, and relationships) shared among products (Robertson and Ulrich, 1998), the interactions are made through a common architecture which is in favor to the development of IoT.

Besides, for external platforms, the terms used are “dominant design” (Abernathy and Utterback, 1978), “keystone firm” (Iansiti and Levien, 2004) or “platform leader” (Gawer and Cusumano, 2002) to indicate that a specific common architecture has emerged to make separately developed components interact with each other

The network effects are more limited for internal platforms compared to external platforms that allow independent firms to contribute favoring the flow of data. However, supply-chain platforms, common in assembly industries, have less control over the components and technology because suppliers can intervene at the periphery and exchange data. The network effects of supply-chain platforms are principally direct from supplier sides, but customers with the variety proposed by suppliers are also interested by the platform generating indirect network effects.

About industry platforms, there are presented as ecosystem beneficial for both side users and complementors thanks to the variety of complementary products and services offered and the size of the installed base of users. The flow of data is not limited because it is necessary for the ecosystem. Close to the industry platforms, sometimes similar, multisided market platforms facilitated the transactions of goods or services between different groups of customers (Evans, 2003; Rochet and Tirole, 2003, 2006) with an important flow of data.

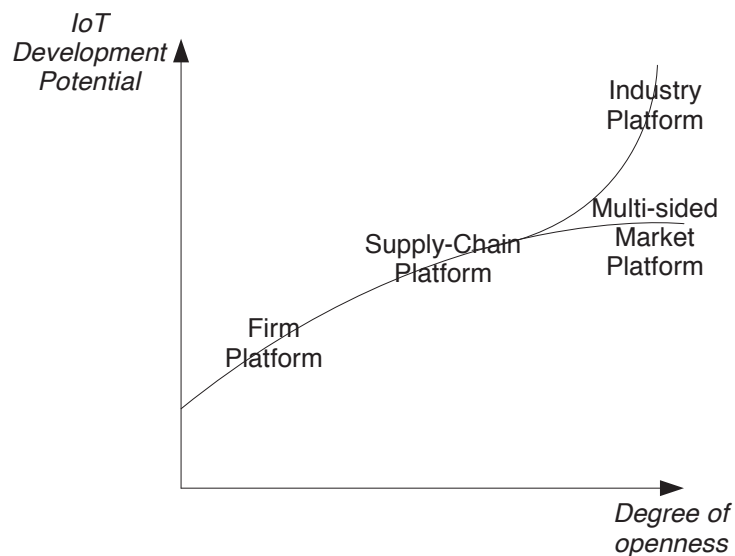
**Table 1: The platforms respecting degree of IoT development conditions**

<i>IoT development conditions</i>	<b>Platforms</b>			
	Firm Platform	Supply-chain Platform	Multi-sided Market Platform	Industry Platform
<i>Internet connection</i>	+	++	+++	+++
<i>Common architecture</i>	++	+	+++	+++
<i>Flows of data</i>	+	++	++	+++
<i>Innovation dynamics</i>	+	++	+	+++

Internal product platforms show a stable architecture with modular components reused (Baldwin and Clark, 2000; Baldwin and Woodard, 2009) that constrain innovation (Gawer and Cusumano, 2014). However, for supply-chain platforms, some openness exists and the suppliers can and are encouraged to innovate but as it was specified only at the periphery, the core is not open.

In the case of industry platforms, the modularity of the platform does not permit to determine what will be the final product or service that is “either unknown ex ante or incomplete” and it “does not seem to be fully predetermined by the platform owner” (Gawer and Cusumano, 2014). For multisided market platforms, the role of innovation is more ambiguous and varies according to the objectives of the platform (Gawer and Cusumano, 2014).

The trade-offs between “open” and “closed” have been discussed (Eisenmann, Parker, and Van Alstyne, 2009; Gawer and Cusumano, 2008; Greenstein, 2009; Schilling, 2009). to determine the best degree of openness for the platform. Concerning the development of IoT, we assume that its development grows with the degree of openness in terms of access to the connection to Internet, the common architecture, the flow of data and the innovation dynamics. So the development potential of IoT increases from firm platforms to industry platforms through supply-chain platforms and multisided market platforms (Figure 3).

**Fig. 3: The IoT development potential by types of platform**

## 5. Discussion and conclusion

### 5.1. Discussion

This article makes three main contributions: to have determined the conditions essential for the development of IoT, to have established how and why platforms can play an important role in the development of IoT, and to have identified which platforms are more favorable to the development of IoT.

We have demonstrated from the literature on IoT that its development requires specific conditions. These conditions are an Internet connection, a common architecture, the flows of data and innovation dynamics. Indeed IoT is used to connect all together stakeholders and things thanks to Internet and a common architecture in order to generate flows of data which is possible all if there are innovations are developed and embedded. All these conditions must be fulfilled for the development of IoT and preferably with the highest level of requirement.

Besides, platforms meet all these conditions from our analysis of the engineering design literature, the economics literature and the strategic management literature. The network of the platform allows an Internet connection required for IoT development. From the engineering design literature, the architecture of the platform supports the common architecture needed for IoT development. From the economics literature, the network effects stimulate the flows of data prescribed for IoT development. And from the strategic management literature, the openness of the platform promotes innovation dynamics recommended for IoT development. The development of IoT is thus linked in part to the future of the platforms. In a way, anything that favors platforms favors IoT development.

However, there is a variety of platforms. They meet the conditions of IoT development but at different level. The industry platform is the best ground for IoT development because it has the highest degree of openness which is beneficial for the Internet connection, a common architecture, the flows of data and innovation dynamics. The multi-sided market platform, between industry and supply-chain platform that can sometimes also be multi-sided market platform, are still widely open but innovation between stakeholders is not necessary supported. Concerning supply-chain platform, the common architecture is managed by the key firm and complementors have to adapt to this architecture that limits complementors involvement. The last platform, the firm platform, is the least open platform that restricts the flows of data and innovation dynamics. So the development potential of IoT depends principally on the emergence of industry platforms but less on multi-sided platforms or supply chain platforms.

## **5.2. Managerial implications**

About companies concerned, in a deliberate or constrained way, by the IoT, they must concentrate on these four conditions and the search or the creation of a platform. The platform must offer an Internet connection as accessible as possible to the company to follow in real time its product or service from beginning to end: from its creation to its development and then its production and then its delivery for its sale and in its use and finally its destruction.

In addition, the platform must be based on the widest possible common architecture so that all modules can easily merge with each other. Indeed, the difficulty lies in the large number of existing modules that must interact together throughout the life of the product or service.

In addition, the platform should facilitate the development of network effects so that the quantity of flows of data is always greater for all stakeholders. They can get as much information as possible from the platform to improve their product or service, or process. The larger the flows of data, more stakeholders will want to join this platform by making it a must.

Finally, the platform should encourage innovation dynamics in particular by opening access to the platform and the development of complementary products and services. Products and services such as processes will only perform better and better. The gains will be felt both in their use and in their production. The goal is to be able to embrace the complexity of reality through all these merged innovations.

Not only do companies need to search or create platforms for IoT development, but platforms can also seize this opportunity to integrate IoT to become the platform leader.

As mentioned earlier, the Internet connection has enabled many platforms to stand out and become leaders in their field. Also, making it possible for things to constantly be connected via the Internet to the platform will make the platform unavoidable and central.

Making architecture as common as possible is also another challenge for the platforms. In this way, all stakeholders will be able to connect and take advantage of the platform. An increasing number of modules will be able to interact together. The modules of all the phases of the life of the product or the service must then be related to the platform.

By increasing the flows of data, the platform will provide information necessary for product and service development as well as process. This increase in information and exchanges will attract other stakeholders who wish to benefit from more resources to improve. The attraction of the platform will be even stronger.

If, in addition, access to the platform is facilitated to modify the platform itself or things gravitating in this platform, then the platform will be the place to be because it will be the locus of innovation. The platform will abound with innovations attracting ever more stakeholders who will want to take advantage of these innovations for new developments or just use them. It will not be a place where only information is exchanged but also a place where knowledge is exchanged.

Therefore, IoT needs platforms to grow. But platforms themselves can benefit greatly from this collaboration to become leaders with advanced design. A symbiosis can take place between the platforms and the IoT that managers have to grasp.

### **5.3. Limits and development paths**

Pour l'instant, nous nous sommes concentrés uniquement sur les aspects essentiels ou rédibitoires au IoT development. Nous n'avons pas évoqué les questions relatives aux plateformes et à l'IoT qui peuvent compliquer ou limiter ce développement.

D'une part, nous avons appuyé la nécessité d'ouvrir la plateforme, d'atteindre un degré élevé d'ouverture. Or, il y a toute une littérature sur les avantages et les risques d'une telle décision. Les questions soulevées relèvent de la complexité, de la compétition, de la security, de la privacy, du moment,... Aussi, le management d'une telle plateforme n'est pas aisé et peut très vite échapper à son ou ses propriétaires. C'est pourquoi, certaines plateformes ont fait le choix de rester des firm platforms ou des supply-chain platforms. Il y a donc un dosage judicieux à trouver dans cette ouverture qui doit se faire de manière coordonner et par étape.

D'autre part, nous avons souligné ce dont à besoin l'IoT pour se développer mais nous ne nous sommes pas intéressés aux difficultés consubstantielles à l'IoT. Les réticences concernant l'IoT sont son accès à Internet créant une vulnérabilité comme le piratage. La collecte de données est aussi évoquée comme source potentielle de conflit entre stakeholders. Ces problèmes qui apparaissent dans l'usage de l'IoT peuvent sérieusement compromettre son développement. D'ailleurs, plus l'ouverture de la plateforme est grande, plus ces risques augmentent. Il y donc a balance à trouver entre les avantages apportés par les plateformes et les risques auxquelles elles exposent.

We have focused only on essential aspects of IoT development. We did not discuss issues related to platforms and IoT that may complicate or limit this development.

On the one hand, we supported the need to open the platform, to achieve a high degree of openness. There is a literature on the benefits and risks of such a decision. The questions raised relate to complexity, competition, pricing, security, privacy, timing... So the management of such a platform is not easy and can quickly escape its owner or owners. This is why some platforms have chosen to remain firm platforms or supply-chain platforms. There is therefore a sensible mix to be found in this opening, which must be done in a coordinated and step-by-step manner.

On the other hand, we have highlighted what the IoT needs to develop, but we have not been interested in the difficulties consubstantial to the IoT. The reluctance regarding IoT is its access to the Internet creating vulnerability like piracy. Data collection is also mentioned as a potential source of conflict between stakeholders. These problems that arise in the use of IoT can seriously jeopardize its development. Moreover, the greater is the opening of the platform, the greater is the risk. There is therefore a balance to be found between the advantages provided by the platforms and the risks to which they are exposed.

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# PREDICTING HIGH AND LOW CUSTOMER ENGAGEMENT IN HEALTH SERVICES

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*Despite the growing acknowledgement of the value of engaging patients in health care services, there is limited available research in the literature. The study aims to contribute to the services marketing and to the health services literature by identifying key predictors and discriminators of customer/patient engagement levels with health services his document is the template for your final paper.*

## 1. Introduction

Over the last decade, patient engagement has been viewed as the cornerstone of the health care system (Sawesi et al. 2016) due its impact on health outcomes (e.g. perceived health services quality and customer satisfaction), and health care cost reduction. Moreover, patients need to be aware of how much they need to get engaged in order to benefit from the available health care system. Specifying these behaviors allows the policy makers, doctors and other stakeholders to understand the magnitude and scope of the challenges patients face in identifying and using effectively and safely health services (Gruman et al. 2010). The growing attention to patient engagement is demonstrated by the increasing number of both academic and managerial publications on this issue in the last ten years (Clancy, 2011).

Despite the growing acknowledgement of the value of engaging patients in health care services, there is limited available research in the literature. Therefore, the purpose of the study is to predict customer engagement levels (high vs. low) based on customer-based variables. Specifically, the objectives of this research are threefold.

- First, the study aims to contribute to the services marketing and to the health services literature by identifying key predictors and discriminators of customer/patient engagement levels with health services.
- Second, several of the proposed variables have not been used before in the services and health services marketing literature as predictors of patient engagement (e.g. Customer and Service Provider Responsible Behavior). Thus, this investigation examines the role of these variables in conjunction with other important concepts such as “Service Expertise”, “Information Sharing”, and “Accepting Information from Service Provider” in predicting Customer Engagement Levels.
- Third, the proposed predictors of engagement can be used for other services as well. Thus, the proposed predictors could also guide managers of other



products in identifying and predicting consumers of various engagement levels.

## **2. Methodology**

The target population for this research is health service customers (patients). Data were collected from a questionnaire distributed to a convenience sample of a South-east European country. A total of 460 completed questionnaires were collected.

All measures of the study were adapted from previous research. Specifically, Service Expertise and Accepting Information from Service Provider were measured with 4 items each and were adapted from Sharma and Patterson (2000). Information Sharing measured with 3 items adapted from Yi and Gong (2013). Customer and Service Provider Responsible Behavior were measured with 4 items each and were adapted from Yi and Gong (2013). Customer Engagement was measured with 4 items derived from Bettencourt (1997) and Lengnick-Hall et al. (2000). A five point Likert scale anchored by Strongly Disagree (1) to Strongly Agree (5) was used in all measures.

## **3. Results**

To identify patients with high and low engagement levels in health services, classification with discriminant analysis was used. In a preliminary analysis of the data, a case analysis was conducted to identify possible outliers and violations of the assumptions of independence, multivariate normality and the homogeneity of variance/covariance matrices. No serious violations of the assumptions were identified. The homogeneity of variance/covariance test (Box's M) indicated that the data did not violate the assumption.

The overall multivariate relationship (MANOVA) was statistically significant at the .05 (chi square=109.47; Wilk's  $\Lambda$ = 0.79;  $p < 0.000$ ) indicating that the two groups are statistically significant different. Thus, the discriminant function extracted was significant and overall the variables used in the study were able to discriminate between high and low engagement groups. The analysis continued by evaluating the contribution of each independent variable to the discrimination of the two groups. All univariate F-tests were significant indicating that all the variables contributed to the discrimination between the two groups of patients. The results for the sample indicated a 70.4% correct classification rate. The findings of the study confirm the proposed hypotheses and provide several theoretical and practical implications. The study is limited to the sample studied and should be replicated to other countries.

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## QUEL SYSTEME INCITATIF POUR LE SERVICE DE COLLECTE DE DECHETS MENAGERS ? ENSEIGNEMENTS TIRES DE LA LITERATURE ECONOMIQUE ET DU CAS FRANÇAIS

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**Résumé :** La réduction du volume des déchets ménagers est un objectif majeur des politiques communales dans le monde. La tarification du service de collecte étant généralement inefficace, la littérature économique promeut un système incitatif qui, le plus souvent, consiste à faire payer le service à la quantité mise en poubelle. En se basant sur des études empiriques, sur l'avancée de la réflexion économique et sur l'expérience française, l'article explique pourquoi cette voie ne peut connaître qu'une extension limitée. D'un côté, sa mise en œuvre rencontre des difficultés pratiques et convient essentiellement à l'habitat individuel. De l'autre, l'analyse des comportements des agents, que leur motivation soit utilitariste ou orientée par des valeurs, montre également les inconvénients qu'une extension trop forte du système pourrait produire. Au total, il est souhaitable que la part incitative du tarif reste modeste. Cela peut sembler insuffisant et contradictoire avec le principe même de la tarification incitative, l'article souligne que ce n'est pas le cas. Toutefois, une stratégie incitative concernant les ménages doit aussi passer par d'autres mécanismes incitatifs. Au niveau des ménages, le système de la consigne est le plus indiqué, car il vise les mêmes objectifs et évite les problèmes de la tarification incitative.

WHAT EFFICIENT AND WORKABLE INCENTIVE SCHEME FOR MUNICIPAL KERBSIDE  
WASTE SERVICES?  
LESSONS DRAWN FROM THE ECONOMIC LITERATURE AND FRENCH CITIES  
EXPERIENCE.

**Abstract:** Reducing the volume of kerbside waste has become a vital goal for many cities in the world. Since the pricing of communal waste services is often inefficient, economic literature promotes an incentive scheme, which most frequently consist in a unit pricing, "pay as you throw" system. Based on empirical studies, advanced economic works and the French experience, the paper explains why this approach is fairly limited. Unit pricing faces practical difficulties and does not fit to collective housing. Whether the households' motivation is utilitarian or value oriented, the analysis of their behaviour shows that, a too large extension of the inducement part of the price, might bring about significant inconveniences. Finally, a small incentive part is to be favoured. It may seem unsatisfactory and contradictory to the very principle of incentive pricing, but the paper underlines it is not so. Nevertheless, an incentive scheme for households must also use other inducing mechanisms. The deposit refund system is the prominent one; it basically aims at the same goals as unit pricing, but avoids its troubles.

Keywords: kerbside waste service pricing; incentive system; deposit refund

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*Notice: although the paper is written in French, the presentation shall be in English*

## INTRODUCTION

En 2014, chaque habitant de l'Union européenne a produit au total 475 kg de déchets municipaux, pour 511 kg en France (données Eurostat). Malgré une légère diminution depuis 2002, la croissance de déchets ménagers depuis des décennies pose de nombreux problèmes, que l'on peut résumer sous l'angle des externalités environnementales négatives. Cela concerne essentiellement les coûts d'élimination et de traitement. S'ajoute aussi l'épuisement des ressources naturelles, qui pourrait en principe être pris en compte dans le prix des ressources concernées, si la myopie ou l'instabilité des marchés n'empêchaient pas une anticipation suffisamment en amont.

La lutte contre la « production » de déchets concerne aussi bien l'offre des produits (versant entreprises), que la demande (versant ménages) (Kinnaman 2010, Ferrara et Missios 2005, Glachant 2005). Chaque versant répond à des caractéristiques particulières et appelle donc une étude spécifique. Cet article s'intéresse à la réduction de la quantité de déchets ménagers ultimes ou résiduels (Ordures Ménagères Résiduelles) « produits » par les ménages, il touche donc aussi au recyclage (y compris compostage) et indirectement à la prévention.

La directive 2008/98 CE fixe un objectif de 50 % de recyclage et de valorisation des déchets ménagers à atteindre pour 2020. Dans cet esprit, le programme national français de prévention des déchets 2014-2020, fixe une cible annuelle de réduction de 10 %<sup>2</sup> (calculée sur la base de 2010) des Déchets Ménagers et Assimilés (DMA) produits par habitant. Pour l'atteindre, au niveau des ménages il prévoit la généralisation progressive d'une tarification incitative du service de gestion des déchets ménagers résiduels, de telle façon que 15 millions d'habitants soient couverts en 2020 et 25 millions en 2025. Cet objectif de réforme de la tarification du service de collecte et de gestion des déchets ménagers est au centre de cet article.

A l'image de nombreux pays, la tarification française traditionnelle du service de gestion des déchets ménagers ne conduit pas les ménages à se préoccuper de la quantité de déchets mise en poubelle (OCDE 2014). Deux systèmes coexistent, aucun des deux n'est efficace de ce point de vue.

Le système le plus fréquemment utilisé est aussi le plus ancien. Il s'agit de la Taxe d'Enlèvement des Ordures Ménagères (TEOM), qui est une taxe assise sur valeur locative. La taxe payée est indépendante du volume individuel ainsi que du total des déchets collectés. Elle ne couvre pas nécessairement le coût global du service rendu, son produit peut donc être insuffisant pour couvrir l'ensemble des coûts.

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<sup>2</sup> Renforcé en 2015, initialement 7%.

Le deuxième système, plus récent, est celui de la Redevance d'Enlèvement d'Ordures Ménagères (REOM). C'est une redevance pour service rendu, qui couvre donc nécessairement le coût global du service. Toutefois, sa répartition entre les ménages est faite selon des critères forfaitaires, indépendants des quantités de déchets mis en poubelle.

Une solution proposée par l'analyse économique pour lutter contre la croissance des déchets ménagers, consiste à mettre en place d'un système incitatif, dans lequel chaque ménage est conduit, par des moyens monétaires, à se préoccuper de sa « production » de déchets (Fullerton Kinnaman 1995 ; Choe et Fraser 1999). Il est ainsi amené à examiner sa consommation sous l'angle de la « production » de déchets. Parmi les différentes possibilités étudiées (consigne, taxe à la mise en décharge, subvention de comportements vertueux...), une tarification en fonction du volume (nombre de levées, poids ou nombre de sacs) est la solution la plus fréquemment mise en œuvre. L'objectif du programme national français de prévention des déchets suit donc cette orientation, en prévoyant la généralisation d'une Tarification dite « Incitative » (TI).

Compte tenu du contexte juridique national, la loi française ouvre deux possibilités de tarification incitative, c'est-à-dire dont une partie varie en fonction de la quantité de déchets mise en poubelle : la TEOM incitative (TEOMi) et la REOM incitative (REOMi). Selon le cas cette part variable est, ou non, encadrée. Dans le cas de la TEOMi, l'article 1522 bis du code général des impôts (introduit en 2012) limite l'étendue de la part incitative, qui doit être comprise entre 10 et 45 % du montant total de la taxe. Dans le cas de la REOMi, l'article L 2333-76 du code général des collectivités territoriales ne prévoit aucun encadrement.

Plusieurs études empiriques montrent qu'une tarification à la quantité permet de réduire le volume de déchets mis en poubelle. Par exemple, Kinnaman et Fullerton (2000a), comparent aux Etats-Unis des municipalités qui ont mis en œuvre un tel système, à d'autres qui ne l'ont pas fait. Ils relèvent que « raising the fee from 0 to \$1 per bag reduces collected garbage from 942 to 530 pounds per capita by 44% ». Kinnaman (2006) ou Bel et Gradus (2014), fournissent des méta-analyses plus récentes et plus étendues qui vont dans le même sens. En France, les données de l'ADEME (2014c), montrent que la mise en œuvre d'une Tarification Incitative (TI), conduit selon les collectivités, à une diminution de 20 % à 70 % des tonnages d'Ordures Ménagères Résiduelles (OMR). La collecte de tri sélectif en vue du recyclage s'améliore en parallèle.

Selon l'ADEME (2016), en France au 1er janvier 2016, 189 collectivités appliquent effectivement une tarification incitative, couvrant ainsi 4,5 millions d'habitants. Le mode de tarification le plus courant (75 % de la population en TI), est le comptage des levées d'OMR ou du nombre de dépôts. Si l'on inclut les collectivités en cours de mise en œuvre et elles qui ont engagé des études préalables, 12 millions d'habitants pourraient prochainement être concernés.

Derrière les satisfecit, il faut toutefois convenir de la faible extension de la TI dans la plupart des pays. En 2011 d'après une enquête portant sur onze pays (OCDE 2014), seuls trois dépassent une proportion de 30% de ménages soumis à une tarification au volume. La Suisse est le pays au chiffre le plus élevé avec 53%. En général la proportion avoisine 10%. Dans le cas de la France, où environ 7% de la population est concernée en 2016, la tarification incitative ne touche qu'une partie des zones rurales et semi-urbaines. Seulement 5 collectivités urbaines (soit au total 400 000 habitants) l'appliquent. Par ailleurs, son développement reste modeste au regard des enjeux. Compte tenu du fait que moins de 5 millions de personnes sont vraiment concernées en 2016, il y a peu de chance que l'objectif de 15 millions pour 2018 soit atteint. Du reste le rythme de progression a tendance à se ralentir

(ADEME 2014c, graphique n°1 Annexe). A cet égard il faut noter que si la loi n°2009-967 « programme de lutte contre les déchets » prévoyait une *obligation* de mise en œuvre de la tarification incitative dans les cinq ans. Dès l'année suivante, sans reconnaître que cela représente une sorte de recul, la loi (n°2010-788) dispose qu'il s'agit d'une *possibilité* à titre expérimental. Compte tenu de l'ambiguïté ainsi produite (une obligation possible à titre expérimental ??), la loi relative à la transition énergétique (n°2015-992), consacre l'abandon de l'obligation généralisée. Elle met en place une orientation progressive, sans fixer de terme obligatoire. Il est donc douteux que l'ambitieux objectif de 25 millions d'habitants soit atteint en 2025. Il aurait placé la France, avec un chiffre de 38,5% de la population couverte, en deuxième position mondiale.

Tout ceci pose la question de savoir pourquoi, malgré ses avantages apparents et de principe, la tarification incitative ne se développe pas plus. A quelles difficultés se heurte-t-elle, qu'elles soient du domaine pratique ou de celui de l'analyse. Quelle démarche incitative au niveau des ménages serait alors plus indiquée pour atteindre les objectifs visés ?

L'article étudiera ces questions en deux étapes. La première partie examine une série de problèmes relevant du domaine de la mise en œuvre. Ils viennent nettement nuancer les conceptions habituelles. La deuxième partie s'appuie sur des études économiques récentes concernant la motivation des ménages. Elles permettent de comprendre que la logique standard, sous-jacente au programme national de prévention des déchets, repose sur une conception incomplète de leurs comportements, qui oublie des inconvénients importants.

## 1) DES DIFFICULTES PRATIQUES CONDUISENT A LIMITER LA PART INCITATIVE

Trois catégories de difficultés pratiques viennent compliquer la mise en œuvre de la nouvelle tarification. Elles en limitent l'extension géographique et conduisent à sensiblement modérer la part incitative.

### 1.1 FAIRE FACE AU COMPORTEMENT DE PASSAGER CLANDESTIN

Dans un environnement ouvert, l'introduction d'une démarche incitative du type envisagé par la loi française, c'est-à-dire essentiellement une tarification à la levée, au poids ou éventuellement au sac, est nécessairement confrontée aux risques résultants du comportement de passager clandestin (Ferrara et Missios 2005)<sup>3</sup>.

Ce risque peut prendre différentes formes. Dans le cas français, l'ADEME (2014b) a recensé plusieurs effets indésirables possibles : des dépôts sauvages de déchets (au pied de points d'apport volontaire, en bord de routes, dans des endroits éloignés), le « tourisme de déchets », le déversement inapproprié dans des conteneurs de tri sélectif et le brûlage de déchets. Dans le cas où la tarification se fait à la levée seule, le compactage individuel (« *Seattle stomp* ») peut aussi se développer. Ces conduites déviantes n'étaient pas prises en compte dans les tous premiers travaux sur le thème de la tarification incitative (Fullerton et Kinnaman 1995). Dans quelle mesure représentent-elles un risque significatif ?

Si l'analyse théorique du problème est maintenant bien développée (CF. deuxième partie), les études empiriques divergent sur sa réalité.

<sup>3</sup> "The single most important obstacle to user fees has been the suggestion that illegal disposal effects may outweigh the potential recycling and waste reduction benefits of a positive user fee." p.235

D'un côté plusieurs études soulignent la validité du problème. Thøgersen, (1994) rapporte que 35% des participants à un sondage concernant la ville danoise de Tinglev, ont déclaré qu'ils brûlaient plus d'ordures depuis qu'une tarification au poids avait été instaurée. Aux Etats-Unis Kinnaman et Fullerton (2000a) constatent que dans leur échantillon, le devenir de plus de 90% (382 livres) de la diminution du poids des déchets est inexplicable. Ils commentent : « Clearly, the wisdom of garbage collection fees depends critically on the ultimate whereabouts of these 382 pounds of missing garbage ». Dans le même état d'esprit, Allers et Hoeben (2010) s'appuyant sur un suivi de 458 municipalités en Hollande pendant 10 ans, soulignent que l'augmentation du recyclage n'explique que 18% de la diminution du volume constaté. En France l'ADEME (2014c) relève que dans les communes qui pratiquent un tarif à la levée et qui n'appliquent pas de forfait minimum, une proportion significative de bacs n'est officiellement jamais sortie dans l'année<sup>4</sup>. Au total le problème est donc réel, mais il reste mal cerné.

Pour autant, on peut penser que, jusqu'à présent, les comportements déviants sont assez limités dans la pratique. En France par exemple, dans son retour d'expérience l'ADEME (2014b) et Gatier (2016a) relèvent que les municipalités en tarification incitative ne sont pas confrontées à une montée forte des comportements déviants. Il faut en effet considérer que, si la partie invisible de la réduction des déchets avait couramment terminé en décharge sauvage, les municipalités auraient rapidement stoppé l'expérience. Du reste dans l'étude économétrique d'Allers et Hoeben (2010) les conduites déviantes ne semblent pas un phénomène significatif.

Cependant, cela ne doit pas conduire à écarter sérieusement le problème pour deux raisons principales.

D'une part, la situation actuelle comporte un biais d'endogénéité ou d'auto-sélection (Allers et Hoeben 2010). Malgré leur diversité, les collectivités qui appliquent une tarification incitative ne sont pas totalement représentatives de l'ensemble des populations et cela à plusieurs titres. Elles se distinguent par le type d'habitat, par l'importance du volume de départ des déchets, par les dispositions de la population envers les questions environnementales et par le niveau d'interconnaissance (surveillance des voisins<sup>5</sup>, contrôle social)... Leurs caractéristiques particulières (pays et zones spécifiques...), facilitent la mise en œuvre et améliorent les résultats de la TI.

D'autre part et surtout, l'inconvénient que le comportement de passer clandestin représente, réside moins dans son extension réelle ex post, que dans les mesures qui doivent être prises ex ante pour en limiter l'ampleur. Cela se traduit par des contraintes qui pèsent, tant sur la conception, que sur la mise en œuvre de la TI. Elles en renchérissent le coût et potentiellement diminuent son acceptabilité.

La tarification incitative à la levée ou au poids, oblige à contrôler l'accès à l'ensemble des poubelles. Cela signifie par exemple que les poubelles individuelles doivent être équipées d'une fermeture personnelle. En habitat collectif, éviter le comportement de passer clandestin est alors particulièrement complexe et coûteux à réaliser. Il est rarement envisageable, comme dans la communauté de communes du pays d'Alésia, de mettre une poubelle personnelle à la disposition de chacun des résidents. Cela explique pourquoi, le plus souvent, la tarification incitative est instaurée dans des zones à habit pavillonnaire dominant, donc rurales où semi-urbaines (Kinnaman Fullerton 1995). En complément, les poubelles publiques librement accessibles devraient en principe disparaître. A nouveau, cela correspond

<sup>4</sup> Ce constat rejoint les réflexions de Ferrara (2011), sur le lien entre fréquence des levées et risque de décharge sauvage.

<sup>5</sup> Illustré pour la Suisse par cette maxime assez en vogue : gott sieht alles! mein nachbar noch mehr, Dieu voit tout, mon voisin encore plus.

mieux à des zones à habitat extensif. Dans le même état d'esprit, le niveau global de surveillance doit augmenter. Les dépôts en déchetterie devraient notamment être plus contrôlés. En toute logique, pour éviter des détournements de trafic, leur accès devrait même devenir payant (ADEME 2014b p.17). Rendre payant un acte de tri sélectif désirable, apparaît pour le moins contre intuitif et désincitatif (CF. deuxième partie).

Le comportement de passager clandestin est évidemment affecté par l'ampleur de la part incitative. Cet aspect sera étudié en détail dans la deuxième partie, mais dès à présent il faut noter qu'une part modeste limite évidemment son risque de survenue.

## 1.2. REDUIRE LES CONSEQUENCES DES EFFETS REDISTRIBUTIFS

Même s'il est économiquement justifié, le changement que représente la tarification incitative peut produire des effets redistributifs (horizontaux et verticaux) socialement indésirables. Cet aspect est très rarement évoqué dans la littérature économique. Pourtant, comme le souligne l'ADEME (2014b) dans le cas français, le montant du tarif du service de gestion des ordures ménagères est généralement un enjeu très sensible. Le plus souvent il s'agit d'une taxe ou d'une redevance pour un service public (*public utility*). Les conséquences de la nouvelle tarification sont alors souvent jugées à l'aune des critères redistributifs inspirés de ceux de la fiscalité, c'est-à-dire la proportionnalité aux capacités contributives et la justice sociale (*fairness*, Cece et al. 2014, Thøgersen 2003). Comme le service est par nature en situation de monopole, le niveau du tarif est d'autant plus sensible. En effet il ne s'agit pas d'un prix sur un marché où existerait un choix entre des services de qualité diverses, avec d'éventuels substituts.

Dans l'échantillon français, où la tarification à la levée domine largement, sauf à introduire des correctifs, le changement de tarification tend à être socialement régressif. C'est particulièrement vrai dans le cas d'un passage de la TEOM vers la REOMi, puisque dans ce cas l'introduction de la tarification incitative se double de la nécessité d'équilibrer le coût global du service. Cependant, quel que soit le système final choisi (TEOMi ou REOMi), le passage à la TI tend à pénaliser certains ménages.

En premier lieu, à cause des investissements nécessaires, il se traduit souvent par une hausse du coût global de fonctionnement du service (CF. section suivante). Toutes choses égales par ailleurs, une telle augmentation touche évidemment plus que proportionnellement les catégories les plus modestes.

En deuxième lieu, le changement de tarification conduit mécaniquement à une augmentation du prix payé avec la taille du ménage (effet horizontal). Les familles les plus nombreuses apparaissent pénalisées, or elles sont davantage modestes (effet vertical) et plus souvent touchées par la pauvreté (Blanpain et Lincot 2015). Symétriquement, les personnes seules bénéficieront plutôt du nouveau système. Contrebalancer la tendance défavorable aux familles, conduit à mettre en œuvre une grille de tarif complexe, qui réduit la dimension incitative (CF. ADEME 2014b). Enfin le système est plus favorable à l'habitat en maison individuelle où le compostage et le brûlage peuvent être facilement pratiqués (effet horizontal). Le bilan ADEME (2014c) p.68 constate d'ailleurs que la réduction la plus importante du volume des déchets en poubelle a lieu dans les communes rurales. Dans les zones urbaines ou péri-urbaines, l'habitat en maison individuelle correspond généralement à un niveau de vie plus élevé (effet vertical).



Au total, que le phénomène soit réel ou plutôt hypothétique, puisque son ampleur dépend du comportement du ménage, la tarification incitative opère une redistribution qui apparaît plutôt socialement régressive. Cette caractéristique dépend éminemment de la taille de la part variable du tarif. L'ensemble des éléments présentés jusqu'à présent plaide donc pour une part incitative modeste. La section suivante renforce encore cette recommandation.

### 1.3 CONTOURNER DES CONTRAINTES GESTIONNAIRES

Cette sous-section rappelle pour mémoire, les différents coûts administratifs que le passage à la TI occasionne et qui sont souvent oubliés. Un examen plus complet nécessiterait néanmoins un article spécifique. La hausse des coûts du service limite, voire efface, les gains individuels tirés de la réduction du volume des déchets.

Comme le relève Kinnaman (2006 p.10), jusqu'à récemment les coûts administratifs liés à la mise en place de la tarification incitative ont largement été ignorés par les économistes. Il cite néanmoins deux études relativement anciennes qui s'y intéressent malgré tout, la première concerne le Danemark (1997), la deuxième une seule ville aux Etats-Unis (1999). Dans les deux cas, le coût de mise en œuvre efface le gain obtenu par les ménages grâce à la diminution du volume de déchets.

La mise en place d'une tarification incitative à la levée ou à la pesée, tend à induire une hausse du coût global du service des ordures ménagères. Le cas de la France illustre ce problème.

Il y a d'abord des coûts d'investissements et de mise en place. Les conteneurs, éventuellement renouvelés, doivent être équipés d'un verrou et d'une puce d'identification. Le verrou coûte parfois aussi cher que le bac lui-même. Les camions doivent être adaptés avec un système de reconnaissance, sensiblement plus complexe en cas de ramassage avec pesée. L'analyse de 15 collectivités françaises fait apparaître un coût moyen d'investissement de 18 €/hbts (valeur HT 2013) (Gentric et Andrup 2015, p.28). S'ajoutent des coûts de personnel pour l'étude et la mise en place... Dans le cas avec renouvellement des bacs, le coût global ex ante est alors compris entre 20 et 30 € par hbts (valeur HT 2013).

Il y a ensuite les coûts de fonctionnement, dont la médiane s'établit en rythme annuel à 5,8 € / hbts (valeur HT 2013). Ces coûts concernent notamment l'adaptation de l'organisation des tournées, le contrôle des décharges illégales et le suivi du système (facturation). Même si la comparaison n'est pas totalement cohérente, on peut constater que ces chiffres représentent une proportion notable du gain que les ménages peuvent éventuellement tirer de la TI (CF. plus loin).

Le système du paiement au sac est le moins onéreux. Aux Etats-Unis 4000 collectivités y avaient recours en 1999 (Kinnaman et Fullerton 2000b). Dans le cas français il n'est utilisé que par seulement 5% de l'échantillon.

Un passage mal maîtrisé à la tarification incitative peut aussi générer des problèmes de gestion d'une autre nature. Comme le souligne Thøgersen (2003 p.202), dans le fonctionnement du service de gestion des ordures, les frais fixes sont élevés. La réduction des OMR peut alors être telle que le service de collecte peut devenir déficitaire. L'incinérateur en fonction peut même se retrouver en sous-utilisation. C'est ce qui est arrivé à la CoCom porte d'Alsace en 1998-99 (Missirian 2014).

Un autre phénomène qui affecte la gestion des déchets, sur un plan plutôt global ou macro-économique, ne sera pas développé dans cet article. C'est le fait que la tarification

incitative réduit l'efficacité d'une démarche de tri centralisé ex post. En effet, en poussant les ménages à pratiquer un tri en amont, elle diminue la valeur ajoutée du contenu des ordures résiduelles (Kinnaman et Fullerton 2010). Le système est donc en partie contradictoire avec une politique de recyclage centralisé ex post.

Pour synthétiser, au moins à moyen terme l'efficacité de la tarification incitative doit s'évaluer en tenant compte des pesanteurs technico-organisationnelles causées par les décisions prises auparavant et les investissements déjà effectués. Dans une certaine mesure ils créent des irréversibilités.

Au total ce qui ressort des trois sous sections précédentes, c'est que pour des raisons pratiques et contrairement à l'intuition, la part incitative doit être modérée. Elle ne doit donc pas être fixée selon le coût marginal social du kilogramme de déchets qui, sans être forcément la politique optimale (Brice 2011), est généralement la référence légitime dans la littérature économique (Kinnaman 2000b). Dans les faits, la partie variable du tarif est fixée en fonction d'une série de contraintes de contexte qui tendent à la réduire. Au Danemark par exemple, dans l'étude de Thøgersen (2003) le gain envisageable de la tarification incitative pour un ménage, n'excède pas 500–600 DKK (65–80 €) par an, soit au plus 7 euros par mois. Ces chiffres sont légèrement plus élevés que ceux de l'échantillon français (CF. deuxième partie) (ADEME 2014a).

Dans cet état d'esprit, l'ADEME (2014a) conseille aux collectivités de ne pas axer leur communication sur la réduction du prix pour l'utilisateur. D'une façon qui peut sembler étonnante, elle invite même à ne pas divulguer la grille tarifaire envisagée trop tôt. Enfin dans un rapport d'analyse de retour d'expérience (ADEME 2014b, p.18), elle alerte contre « la tendance à vouloir être trop incitatif ».

Compte tenu de ces éléments, l'incitation doit être faible. Cela peut sembler contradictoire avec le principe même de la démarche incitative. En effet, comme le rappellent (Gneezy et al. 2011 p.191) 'The basic "law of behavior" is that higher incentives will lead to more effort and higher performance'. La partie suivante montrera que ce n'est pas un problème, aussi bien théoriquement, que pratiquement.

## 2) UNE LOGIQUE EN PARTIE MAL COMPRISSE : LA PART INCITATIVE NE DOIT PAS ET N'A PAS BESOIN D'ETRE ELEVEE

Cette deuxième partie explique pourquoi les raisons pratiques qui conduisent à une part modulée modeste ne sont pas un échec ou un contournement des principes de la tarification incitative. Cet état de fait est justifié par des raisons théoriques solides, qui résultent de l'analyse du comportement des agents. En outre, cela n'affecte pas sensiblement l'efficacité de l'incitation.

Bien que le comportement de tous les ménages puisse être décrit comme maximisateur d'utilité, tous n'évaluent pas l'utilité de la même façon. Ils peuvent se singulariser par leurs préférences, autrement dit par ce sur ce quoi porte l'utilité. Or cela détermine leur motivation qui est le moteur de leur comportement.

La littérature comportementale permet de définir deux types idéaux de motivation, qui représentent les deux pôles d'un continuum de possibilités. D'un côté le type utilitaire pur (comportement orienté par un calcul marchand), dans lequel le comportement est uniquement

fonction des incitations monétaires. C'est le type modélisé par l'analyse économique traditionnelle. De l'autre, le type civique pur, dans lequel le comportement est fonction de considérations morales (comportement orienté par des valeurs).

Cette distinction retrouve les deux modèles de rationalité analysés par Max Weber (Zweckrationalität, Wertrationalität). Elle s'inscrit dans une perspective habituelle pour la production de déchets ménagers, qui distingue les motivations monétaire et non-monétaire (Kinaman 2006). Une partie de la littérature (Thøgersen 1994, 2003, Cece et al. 2014), s'appuie cependant sur une approche inspirée des concepts utilisés en psychologie et développée par Deci (1970), qui distingue les motivations extrinsèque et intrinsèque. Le plus souvent ces deux perspectives se rejoignent, en ce sens que la motivation monétaire est extérieure (rétribution externe), alors que l'action orientée par des valeurs, en tant que résultat d'un choix personnel, est d'abord interne (*individualistic based altruism*). Elles ne se recouvrent toutefois pas totalement. Ainsi l'effet de réputation (*warm glow, peer pressure*), fréquemment mis en avant comme justification du tri sélectif, pour être une motivation non monétaire, n'en est pas moins extrinsèque. L'intérêt de la perspective psychologique est cependant de souligner que l'incitation monétaire, en tant que réponse à un stimulus extérieur, représente une contrainte (CF. plus bas). Ce n'est pas le cas de la motivation liée aux valeurs, qui reste intrinsèque.

Les études empiriques (notamment Hage et al. 2009) montrent que les motivations monétaires et morales interviennent habituellement de façon combinée dans le comportement de tri ou de recyclage. Pour mieux comprendre leur interaction avec la tarification incitative, il est toutefois nécessaire de les étudier séparément.

## 2.1 LA MOTIVATION UTILITARISTE ET LE RISQUE DE COMPORTEMENT DEVIANTS

Toutes choses égales par ailleurs<sup>6</sup>, les ménages pour lesquels la motivation utilitariste est dominante, sont enclins à considérer que la tarification incitative, en tant que modification imposée de leur environnement, est une contrainte coûteuse et éventuellement déplaisante. Ce que Johansson (2016 p. 407) illustre sous cette forme : « Waste recycling is seldom considered to be an exciting task and it is fairly easy to cheat ». Trois types d'arguments tirés d'études empiriques, soutiennent ce point de vue :

En premier lieu et toutes choses égales par ailleurs, le fonctionnement même de la tarification incitative conduit à ce que, sans changement de comportement, le prix payé est plus élevé. La nouvelle tarification introduit donc une contrainte monétaire, qui n'apparaîtra comme une opportunité favorable qu'à ceux qui entrevoient immédiatement des moyens simples et accessibles de réduire le volume de leurs déchets mis en poubelle.

En deuxième lieu les ménages ont tendance à considérer qu'ils ne sont pas les principaux responsables du volume de déchets ménagers. Les entreprises leur apparaissent en première ligne. C'est ce que soulignent les enquêtes réalisées par Jolivet (2001). Les ménages subissent le volume de prospectus en boîte aux lettres, les emballages multiples et aux formats encombrants... ils ont donc tendance à se considérer comme « victimes » des industriels. Ils ne se reconnaissent qu'une responsabilité « secondaire » :

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<sup>6</sup> En particulier à tailles de ménages égales.

- « C'est pas le consommateur qui veut trois épaisseurs de carton sur un produit, c'est bien l'industriel qui décide(...) on n'a pas à faire subir au consommateur ce qu'une entreprise n'a pas fait »
- « C'est le fabricant qu'il faut taxer, pas le consommateur, c'est à lui de prendre conscience, (...), on est mis devant le fait accompli par le fabricant »
- « On n'est pas tellement maîtres de nos emballages [...] ce serait plutôt aux entreprises d'être taxées [...] elles réfléchiraient peut-être sur le problème ». (Jolivet 2001 p. 200).

Enfin d'autres études révèlent que l'idée de contrainte est particulièrement présente chez les personnes qui ne trient pas régulièrement leurs déchets (Dupré 2013). Cela signifie que, fort logiquement, la contrainte est surtout ressentie par ceux qui devront effectivement changer leur comportement. Cette contrainte se décline en trois dimensions : le tri demande des efforts, prend du temps et nécessite un ou des espaces dédiés. Cela est d'autant plus ressenti que le consumérisme ambiant dans la société occidentale diffuse plutôt une « culture de la complaisance » (Dupré 2013).

Selon les ressources dont ils disposent (situation personnelle et contexte local), les agents utilitaristes vont donc s'adapter à la nouvelle tarification en combinant dans des proportions variées, réduction du volume de déchets (tri, recyclage, modification de leur consommation, compostage...) et pratiques de contournement (décharge illégale, brûlage d'arrière cours...) (Kinnaman 2006, Thøgersen, 2003). Dans les deux cas, que ce soit pour bénéficier d'une compensation, ou pour éviter une pénalisation, ils mettront en œuvre des efforts, que l'on peut qualifier selon leur visée de « positifs » ou « négatifs ». Ces efforts représentent un coût, qui doit être comparé à la valeur de leurs résultats, afin d'en déterminer le gain net (rendement).

Du point de vue du bien-être collectif, le résultat des efforts individuels devrait être évalué par les ménages à travers leurs conséquences marginales pour la collectivité. Dans la pratique, il est plutôt valorisé par le gain potentiel obtenu grâce au tarif. De ce point de vue, le tarif incitatif doit être suffisamment rémunérateur pour favoriser les efforts positifs. Cependant, comme cela augmente en même temps la rémunération tirée des efforts négatifs, il faut développer en parallèle la dissuasion des comportements illicites (contrôles...) (Choe et Fraser 1999). Il s'agit ainsi de réduire le gain net moyen tiré des efforts négatifs, mais cela alourdit le coût global de fonctionnement de la tarification incitative. Plutôt que de jouer sur la rémunération des efforts positifs, une manière plus judicieuse de réduire les risques de comportements déviants, consiste à diminuer le coût des conduites vertueuses. Il s'agit alors de faciliter l'accès à des moyens simples de diminution du volume de déchets, en développant les dispositifs de tri ou de recyclage (déchetterie...), y compris en instituant des systèmes de consigne (CF. conclusion). Contrairement à une logique a priori, évoquée dans la première partie et à une préconisation de l'ADEME (2014b), l'accès aux moyens de tri et de recyclage ne devrait pas être rendu payant. Il faut du reste noter à cet égard, que le simple fait de trier les ordures et de se déplacer en déchetterie représente un coût, assimilable à une barrière à l'entrée.

Pour autant, si la situation d'un ménage est telle que la rémunération obtenue ne couvre pas le coût de ses efforts positifs, il développera un sentiment d'injustice et de frustration. Dans ce cas de figure, la tarification incitative nourrira des conduites déviantes (ADEME 2014b). C'est pour cette raison, qu'en présence de facilités d'évitement illégal, conjuguées à des externalités négatives élevées, la théorie économique légitime la rémunération du tri et du recyclage (Fullerton et Kinnaman 1995, Ferrara 2011).

Dans la pratique toutefois, même si la littérature reste partagée (Kinnaman 2000b), le phénomène d'évitement illégal reste généralement modéré (CF. première partie). Cela traduit certainement le fait que dans les collectivités qui pratiquent la tarification incitative, le rendement global comparé des efforts positifs et des efforts négatifs reste plus favorable à un comportement légal. Cela traduit aussi un attachement moral pour le respect de la légalité (CF. sous-section suivante). Cela dit, comme dans les études empiriques toute la population d'un pays n'est pas couverte, ce constat peut également résulter d'un biais d'auto-sélection (CF. première partie).

Il reste encore un élément à analyser. En toute rigueur et pour un tarif donné, l'appréciation individuelle de la comparaison coûts des efforts/ rémunération, dépend du revenu du ménage considéré. Plusieurs auteurs ont ainsi remarqué qu'en principe, la tarification n'est vraiment incitative que pour les ménages les moins aisés (Kinnaman 2000a, Viscusi 2013). Même si la littérature économique souligne que cet effet est, dans la pratique, largement contrebalancé par celui du niveau d'instruction (Kinnaman and Fullerton 2000 p.437), son éventualité ne peut pas être totalement écartée. Ainsi Ashenmiller (2009) constate un phénomène de ce type en Californie pour la consigne des bouteilles.

Il n'en reste pas moins que, quel que soit le niveau de revenu, pour un ménage utilitariste il existe un seuil en dessous duquel la variation du prix payé produit de trop faibles effets incitatifs<sup>7</sup> (CF. plus bas fin de la deuxième section). En France, l'étude de l'ADEME<sup>8</sup> (2014c p.61) fournit un indicateur qui permet de calculer une estimation de ce seuil.

L'indicateur compare les effets incitatifs des systèmes de tarifs de 59 collectivités locales. Il se base sur le gain potentiel d'un ménage de deux personnes, qui réduirait son volume de déchets de 50%. L'étude constate qu'en dessous d'un gain annuel potentiel de 10€, la production moyenne de déchets reste élevée (au moins 150 kg/hbts/an)<sup>9</sup>. Ce n'est qu'aux environs d'un gain annuel potentiel de 40€ que le niveau moyen des déchets descend significativement. Il devient alors inférieur à 132kg/hbts/an (médiane de l'échantillon). Au-delà de 50€ de gain annuel potentiel, la diminution du poids des déchets ralentit rapidement, le poids résiduel atteint une limite d'environ 100 kg/hbts/an, pour un gain théorique annuel de 120€ (CF. Graphique n°2 en Annexe).

L'effet utile de la variation du gain potentiel est donc surtout valable à l'intérieur d'un intervalle de gains donné. Cet effet est d'ailleurs non linéaire (démarrage rapide, segment efficace court, longue traîne). Il peut être ajusté par une courbe logarithmique (CF. Graphique n°2 en Annexe). Une incitation monétaire élevée est donc superflue.

La série des couples de prix unitaires pour une levée de bac de 120 litres et de poids moyens annuels des ordures ménagères par habitant, permet de calculer une élasticité prix. Cette élasticité est un peu particulière puisqu'elle ne concerne pas un même ensemble de ménages réagissant à un même système de prix, mais porte sur des collectivités différentes, avec des systèmes variés. L'élasticité-arc calculée sur l'ensemble des 59 collectivités, est assez modeste, elle ressort à -0,018<sup>10</sup>. Exprimé autrement, cela signifie qu'une hausse de 1€ du tarif de levée du bac de 120 litres, produit une baisse moyenne d'environ 13 kg du poids

<sup>7</sup> Entendu ici au-delà de sa simple mise en place. Dans l'échantillon français, la seule mise en œuvre de la Tarification Incitative a amené une baisse des ordures ménagères résiduelles moyenne de 41,7%.

<sup>8</sup> 59 collectivités locales regroupant 3,5 millions d'habitants.

<sup>9</sup> Autrement dit, dans les communes, où une réduction de 50% du volume moyen de déchets ménagers « rapporte » moins de 10€ par an, le volume moyen par an et par habitats est d'au moins 150 kilogramme.

<sup>10</sup> Lorsque le prix augmenté de 1%, le volume de déchets baisse de 1,8 %. Il s'agit du rapport des variations relatives des prix et des volumes, calculé sur des couples de valeurs de tarifs pour une levée (bac de 120 litres) ; le poids moyen annuel est issu d'une régression logarithmique des collectivités locales concernées (ADEME-Citexia 2014c p.59).

annuel de déchets par habitant<sup>11</sup>. Ces résultats assez modestes sont cohérents avec ceux donnés par Kinnaman (2006). Bel et Gradus (2014) relèvent pourtant que l'élasticité est généralement plus élevée lorsque la tarification incitative porte sur des levées de bac, ce qui est le cas ici.

Au total, un ménage utilitariste réagira à la contrainte du tarif incitatif en fonction d'un calcul de type coûts- avantages. Son comportement loyal ou déviant variera selon le montant de la part variable du tarif, de sa situation personnelle et du contexte (type d'habitat...). Pour éviter le risque de passer clandestin, il est souhaitable à la fois de prévoir un effet incitatif modeste et de mettre à disposition des ménages des solutions de substitution à la mise en poubelle, facilement accessibles.

## 2.2 LA MOTIVATION ORIENTEE PAR LES VALEURS ET LE RISQUE DU CHANGEMENT DE REGISTRE

Les ménages pour lesquels le deuxième type de motivation domine réagissent différemment des ménages utilitaristes. Dans leur cas, la réduction du volume de déchets ménagers ultimes est un objectif conforme aux valeurs civiques qui les motivent. L'effort souhaité ne leur apparaît pas comme une contrainte extérieure, mais comme un devoir civique légitime. Toutefois le mécanisme d'incitation monétaire (*tangible rewards*) utilisé peut altérer leur motivation.

Comme le souligne Montesquieu dans le chapitre V de l'Esprit des Lois, la *vertu politique*, ou le civisme : « est un renoncement à soi-même, qui est toujours une chose très pénible. On peut définir cette vertu, [comme] l'amour des lois et de la patrie. Cet amour, demandant une préférence continuelle de l'intérêt public au sien propre, donne toutes les vertus particulières : elles ne sont que cette préférence ». Le civisme consiste donc, par un effort conscient, à faire prévaloir des intérêts généraux, sur des intérêts particuliers. L'environnement est un domaine particulièrement propice à sa mise en œuvre.

La tarification incitative s'inscrit quant à elle dans un cadre différent. Comme elle s'adresse d'abord à l'intérêt personnel, ainsi que l'exprime le slogan « plus je trie, moins je paie »<sup>12</sup>, elle donne le sentiment de valoriser un comportement lucratif ou « intéressé ». Elle peut donc contredire une démarche purement civique. La littérature économique (Mellström Johannesson 2008) évoque à ce sujet un risque d'éviction (*crowding out effect*). Le principal phénomène étudié sous cet angle à la suite des travaux de Titmuss (1970), est le don du sang. Plusieurs études ont souligné que la rémunération du don du sang pouvait, dans certaines circonstances, réduire la collecte (Shi 2010). Dans le domaine environnemental, Alberts et al. (2016) fournissent un exemple de ce type : un mécanisme monétaire incitatif destiné à réduire la consommation d'électricité a au contraire, conduit à l'augmenter.

Suivant cet ordre d'idée, certains travaux concernant les déchets ménagers, soulignent que le principe de rémunération monétaire s'oppose à celui qui anime l'essentiel des ménages qui pratiquent le recyclage ou le tri. Berglund (2006) pour la Suède, respectivement Thøgersen (2003) pour le Danemark, montrent ainsi que la motivation civique est la

<sup>11</sup> Coefficient directeur d'une droite de régression linéaire construite à partir des couples de valeurs de tarifs à la levée (bac de 120 litres)-poids moyen annuel, issus d'une régression logarithmique des collectivités locales concernées (ADEME-Citexia 2014c p.59)..

<sup>12</sup> <http://www.emag.suez-environnement.com/tarification-incitative-plus-trie-moins-paye-17295> ;

L'équivalent anglo-saxon : *pay as you throw*. met plutôt l'accent sur le fait de payer en proportion des quantités jetées, donc d'acheter un service.

motivation principale du recyclage. Cece et al. (2014), en s'appuyant sur un large panel de consommateurs de l'UE, constatent une motivation similaire pour la réduction de déchets alimentaires. L'incitation monétaire pourrait alors contrecarrer pour ces ménages la motivation civique de réduction des déchets. Elle pourrait même aller jusqu'à l'oblitérer, en produisant un changement de référence (*framing effect*). Une étude célèbre dans cette voie concerne une situation où, la pénalisation monétaire de parents en retard pour récupérer leur enfant à la crèche, a abouti à une augmentation de la fréquence des retards (Gneezy et Rustichini 2000a). Le phénomène s'est maintenu après la suppression des pénalités financières, soulignant que le changement du registre de l'action a un effet durable.

S'agissant de la production de déchets ménagers, en comparant des municipalités danoises qui mettaient en œuvre la tarification incitative, à d'autres qui ne la pratiquaient pas, Thøgersen (1994) a notamment pu constater que, dans celles avec tarification incitative, la motivation des ménages basculait en majorité vers une motivation utilitariste, du type coûts-bénéfices. Cette évolution entraînerait une modification de leur attitude envers le tri et le recyclage. Ils chercheraient alors à obtenir une compensation monétaire suffisante pour couvrir le coût de leurs efforts. Le risque, pour les autorités publiques, est alors d'avoir à rémunérer un comportement qui auparavant s'effectuait de façon bénévole, ou de devoir proposer une rémunération plus élevée que celle envisagée, ou bien encore, de devoir simultanément réduire très significativement le coût des efforts positifs. Dans tous les cas, le changement de motivation tend à augmenter les dépenses liées à la tarification incitative.

Le changement de registre n'est pas uniquement lié à une altération ou à un remplacement de la motivation, comme cela est souvent considéré.

Le civisme ainsi que le souligne fort justement Montesquieu, n'est pas seulement une préférence innée. En tant que démarche volontaire et consciente, il s'agit aussi d'« une chose très pénible », qui demande un effort de renonciation à soi. Fort heureusement, le civisme est récompensé par une satisfaction morale, qui provient précisément de son caractère désintéressé. Il y a ainsi une sorte de corrélation inverse entre valeur du civisme et rémunération. Du reste le comportement désintéressé est fort à propos mis en valeur dans la vie publique. A contrario, une incitation monétaire officielle, qui encourage ouvertement une conduite intéressée, tend à dévaloriser l'effort volontaire et bénévole. En conséquence elle le rend moins symboliquement rémunérateur (motivation interne). Ce phénomène peut s'interpréter sous la forme d'une dégradation de la qualité économique du bien obtenu grâce à l'activité choisie (bien supérieur vs. bien inférieur) (Bruno 2013). Parallèlement, la rémunération monétaire peut aussi engendrer une détérioration de réputation (motivation externe). Elle mine alors le comportement civique, parce qu'elle détériore le signal de bonne réputation qui lui était auparavant associé (Shi 2010 ; Gneezy et Al. 2011).

Le paradoxe ici est donc que la démarche économique qui encourage monétairement un comportement collectivement souhaitable, sape en même temps la motivation civique de ce même comportement. C'est que le cadre juridico-réglementaire d'une société, n'est pas seulement un système de gratifications et de sanctions à vocation comportementale, il exprime des valeurs/normes sociales de référence en tant que telles (Ferey 2013), qui contribuent à l'image des agents (Gneezy et Al. 2011). Ces phénomènes sont particulièrement sensibles lorsque des services publics ou des objectifs collectifs (*prosocial goals*) sont en jeu, parce que de nombreux ménages s'attendent à ce qu'ils soient gérés selon un référentiel non utilitariste.

L'introduction d'une incitation monétaire avec une perspective de gain, peut donc conduire à faire basculer les agents dans le champ de référence des activités professionnelles, qui supposent une rémunération conforme aux standards du marché du travail. Du point de

vue des politiques publiques, Gneezy et al. (2000b) en déduisent alors l'alternative : *Pay enough—or don't pay at all*. Cela dit, toute gratification monétaire n'est certes pas l'ennemi d'une motivation civique<sup>13</sup>. Sur ce plan aussi il existe un effet de seuil. C'est ce que constate Shi (2010) pour le don du sang. Même si, sur ce point, un certain flottement peut être constaté dans la littérature sur les déchets (Thørgersen 1994 ; 2003)<sup>14</sup>, le changement de registre dépend de fait des montants en jeu et de l'environnement institutionnel dans lequel la TI est mise en place. Si le montant considéré, comme la communication institutionnelle, évoquent aux ménages civiques une démarche marchande ou commerciale, cela va tendre à contrecarrer leur motivation. En revanche une rémunération (part variable du tarif) modeste, d'ordre symbolique, présentée comme telle s'accordera mieux avec leur démarche. Elle s'apparente alors à une gratification, à une reconnaissance des mérites, plutôt qu'à une rémunération (Gneezy et al. 2011, Alberts et al. 2016). C'est notamment pour ces raisons, que les conseils de ne pas axer la communication sur les gains monétaires, ou sur la future grille tarifaire, donnés par l'ADEME (2014a) sont particulièrement pertinents. En somme, le *framing effect* peut donc être évité, mais cela suppose de gommer les aspects les plus lucratifs de la TI.

Finalement, le montant de l'incitation est bien un élément déterminant, mais pas dans le sens couramment compris où, plus il serait élevé, plus l'incitation serait forte. En fait, au-delà d'un seuil modeste, il peut y avoir une perte d'efficacité liée au mécanisme monétaire.

Dans le cas de la motivation utilitariste, cela provient de la montée concomitante des incitations au comportement de passager clandestin. Dans le cas de la motivation civique, c'est l'affaiblissement des valeurs civiques qui pose problème. Au total, cela engendre une hausse des coûts de contrôle et une attente de vraie rémunération.

Il est donc globalement souhaitable que la part incitative soit modeste. Si cela contrarie le fonctionnement de la *tarification* incitative, cela ne remet pas en cause l'efficacité de la *démarche* incitative et cela pour deux raisons.

En premier lieu et pour l'essentiel, plus que du fonctionnement de la tarification incitative une fois mise en place, la diminution de la quantité de déchets provient de sa période de mise en œuvre (Gatier 2016a p.25). C'est en tout cas ce que l'on constate sur l'échantillon français (Annexe graphique n°3). La TI fonctionne plus comme un déclencheur, que comme un mécanisme d'arbitrage en continu. Le volume de déchets baisse donc rapidement pour se stabiliser à un nouveau niveau d'équilibre. Il est même frappant de constater que l'ajustement se fait, pour l'essentiel, avant la mise en place du nouveau tarif, alors même que l'incitation monétaire n'est pas encore effective. Cela ne correspond pas à un comportement utilitariste pur, puisque les efforts mis en œuvre ne sont pas encore rémunérés. Cela correspond plutôt à un comportement civique et confirme les travaux sur la motivation du tri et du recyclage. L'annonce de la tarification incitative joue alors le rôle d'un rappel du

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<sup>13</sup> Il ne s'agit pas ici de refaire le débat sur les vices privés qui peuvent objectivement conduire à des vertus publiques ou collectives. Il s'agit simplement de constater, quelle qu'en soit la raison, que les agents à motivation civique peuvent considérer que, dans ce domaine, l'incitation monétaire n'est pas légitime.

<sup>14</sup> "If the incentive is small (which is often a prerequisite for economic efficiency) there is a serious risk that the re-framing effect overpowers the stimulating impact of the incentive on the behavior". Thørgersen 1994.

"The overall conclusion of this study is that under realistic and not uncommon conditions the non-economic motivational impacts of a (small) economic incentive can boost its effect on behaviour over and above that of the direct price-effect. This is, of course, an encouraging message for those currently putting their bets on market-based instruments. However, the finding that the behavioural impact depends on how the incentive scheme is perceived is a two-edged sword" Thørgersen 2003



comportement civique attendu. Il faut néanmoins garder à l'esprit que l'échantillon est étroit et biaisé.

En deuxième lieu la tarification incitative n'est pas la seule *démarche* incitative envisageable. Cela sera rappelé dans la conclusion.

### 3. CONCLUSION : LA DEMARCHE INCITATIVE DANS UNE PERSPECTIVE PLUS LARGE

Dans le domaine du service de collecte et gestion des déchets ménagers, les arguments pratiques, comme les raisonnements théoriques conduisent à préconiser une tarification incitative dont la part variable est modeste, combinée avec la mise en place de moyens de tri ou de recyclage gratuits. Cela peut paraître contradictoire avec le principe de l'incitation, mais l'article montre que c'est un compromis légitime et efficace. En effet cela limite les comportements déviants et évite de saper la motivation civique des ménages non utilitaristes. En outre, cela tient compte du fait que l'essentiel du gain environnemental tiré du passage à la tarification incitative provient de sa mise œuvre en tant que rappel du comportement souhaitable. Dans ces conditions, il est inutile d'engager les collectivités locales dans des investissements élevés, ou des démarches trop sophistiquées. Un simple système de sacs payants peut suffire (ADEME 2014b).

Pour autant, l'extension géographique de la tarification incitative reste assez modeste, essentiellement parce qu'elle est coûteuse et complexe à mettre en place, en particulier dans les agglomérations urbaines où l'habitat collectif domine. Dans celles-ci, ses inconvénients pratiques (identification des producteurs de déchets...) ou théoriques (comportements déviants...) tendent à dominer.

Compte tenu des inconvénients potentiels de la *tarification* incitative, la *démarche* incitative doit être conçue dans une perspective plus large, à la fois en termes de motivation et en termes de dispositifs. La tarification incitative appliquée à la mise en poubelle, peut être complétée ou remplacée par d'autres dispositifs. Si la tarification amont fonctionne surtout comme un complément (Glachant 2005), dans le domaine aval, d'autres démarches peuvent jouer avantageusement le rôle de substitut. Le système de la consigne, en grande partie abandonné et considéré en France comme passéiste, est pourtant un excellent candidat (Walls 2011).

La consigne vise des objectifs similaires à ceux de la tarification incitative : à savoir diminuer le volume des déchets ultimes, tout en améliorant la collecte sélective aux fins de recyclage. Bien qu'elle repose sur un mécanisme incitatif, les objectifs environnementaux poursuivis peuvent être atteints en évitant les écueils étudiés dans cet article.

Le système contourne le problème du passager clandestin. Cela ne signifie pas que tous les utilisateurs rapportent les objets consignés, mais que ceux qui ne le font pas ne peuvent échapper à une sanction monétaire. En ce sens, la stratégie du passager clandestin n'est donc jamais « payante ».

Même si le mécanisme incitatif de la consigne s'appuie sur un montant monétaire, il a beaucoup moins de risque de produire un changement de registre, que la tarification incitative. D'une part, les montants unitaires en jeu sont nécessairement modestes. D'autre part le comportement civique est le seul valorisé, plutôt qu'un comportement intéressé ou égoïste. Sous la forme du comportement de passager clandestin, ce dernier est systématiquement

pénalisé. Il n'est pas non plus valorisé sous la forme d'un gain rémunérateur, puisque le système ne fournit qu'un remboursement. D'une façon ou d'une autre il n'y a pas de gain réel possible. Le système s'apparente donc à celui de la caution<sup>15</sup>. Il s'agit de rendre crédible ou de garantir un engagement vertueux.

Le système n'est pas sensible au type d'habitat (individuel / habitat collectif). Il est plus simple à mettre en œuvre, puisqu'il ne nécessite pas d'équipement particulier des poubelles individuelles ou d'investissements dans un équipement spécial des camions de collecte.

L'incitation reste relative au niveau de revenu, mais le système ne pénalise pas les ménages les plus modestes. En ce sens il n'occasionne aucun effet redistributif vertical ou horizontal. Néanmoins il peut éventuellement fournir une source de revenu en faveur des ménages qui collecteraient des produits consignés abandonnés. Ce qui est une externalité favorable pour la collectivité.

Enfin, si la consigne nécessite évidemment la constitution d'un réseau de collecte, il n'est pas nécessaire de constituer un réseau exhaustif, en porte à porte. Dans ce système les ménages se déplacent jusqu'au point de dépôt. Cela améliore globalement la qualité de la collecte sélective, mais en cas de tri centralisé ex post, réduit corrélativement la valeur ajoutée du contenu des poubelles.

Au final, l'objectif de réduction des déchets ménagers ultimes, sera certainement plus facile à atteindre au niveau mondial, en faisant une large place à la consigne dans une démarche incitative élargie.

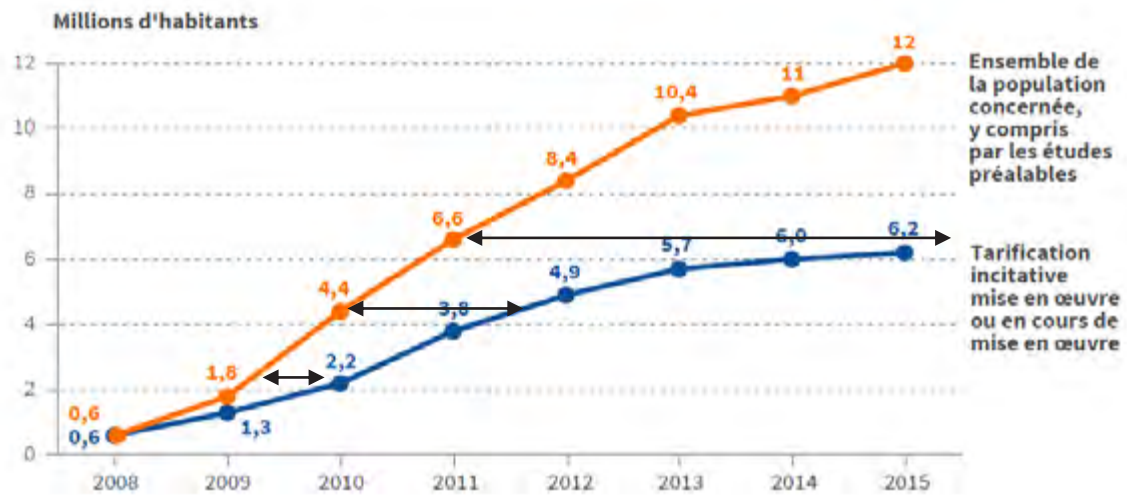
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<sup>15</sup> Certains économistes interprètent la consigne comme une taxe sur la mise en décharge (Fullerton and Wolverton 2000), mais cela ne concerne que les ménages qui ne rapporteraient pas les objets consignés. Pour les autres, le parallèle avec le système de la caution apparaît plus pertinent.

ANNEXES

Graphique n°1

Évolution du nombre d'habitants concernés par la tarification incitative en France, depuis les études préalables jusqu'à la mise en œuvre

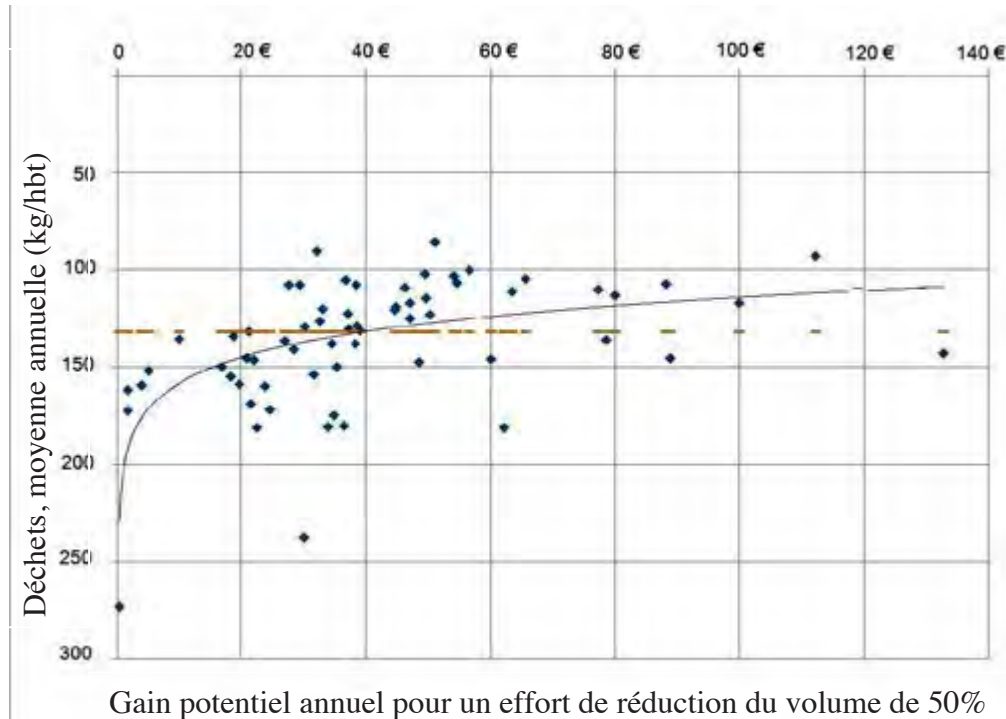


ADEME 2016 p. 32

NB. On peut noter l'allongement de la durée du passage des études à la réalisation (flèches horizontales) : en 2015 le niveau envisagé en 2011 n'est pas encore atteint.

## Graphique n°2

**Diminution du poids moyen annuel du volume de déchets par collectivité en France,  
en fonction du gain théorique tiré d'un effort standardisé de réduction de 50%**



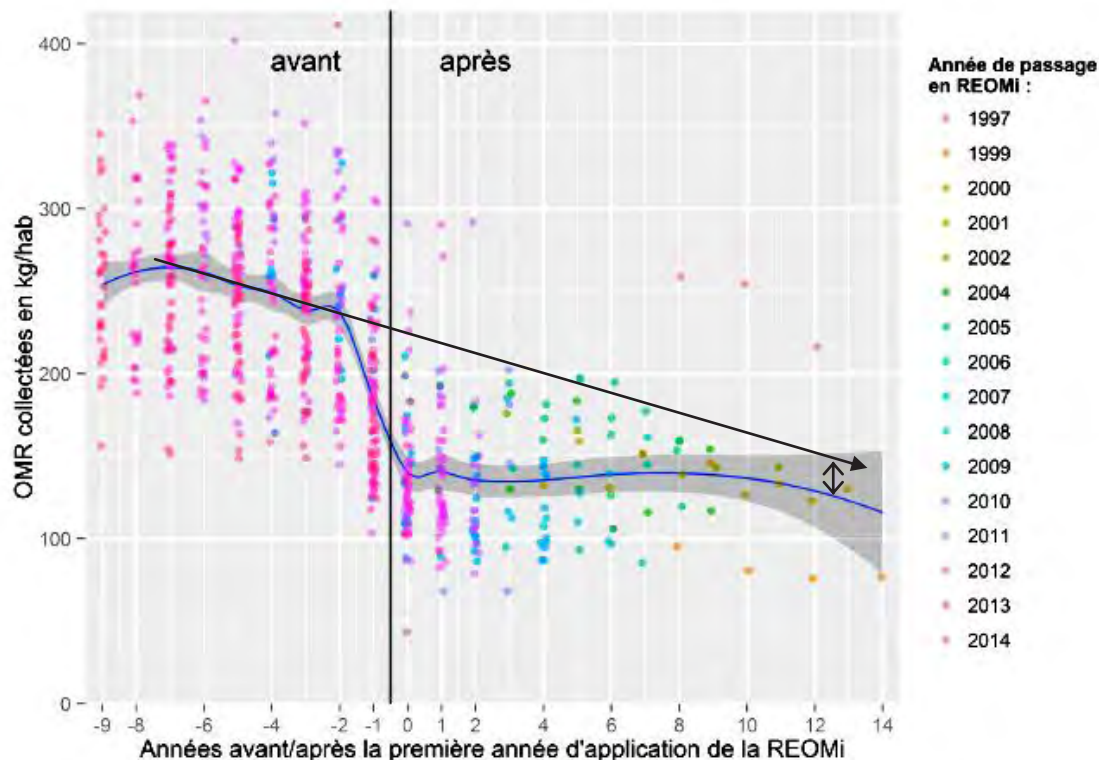
ADEME 2014c p. 62 (retraitement par l'auteur du graphique original)

Mise en évidence de la relation entre les économies théoriques de la facture déchets d'une famille de 2 personnes et la production d'Ordures Ménagères Résiduelles (OMR) (59 collectivités en redevance incitative au 1er janvier 2013 ; production d'OMR 2013).

En pointillé orange, figure la production d'OMR médiane de l'échantillon analysé.

### Graphique n°3

#### Ordures Ménagères Résiduelles collectées dans les collectivités passées en redevance incitative en France, selon l'année et la date de passage



Note : la courbe est lissée par régression locale (LOESS, degré 2,  $\alpha = 1/3$ ),

1. L'intervalle de confiance à 90 % sur la valeur lissée est représenté. À noter que ce graphique ne représente pas l'évolution chronologique des tonnages moyens d'OMR pour un groupe de collectivités passant en REOMi car on ne suit pas ici un même groupe mais différentes cohortes pour lesquelles on connaît les 5 années impaires entre 2005 et 2013. L'année 0 désigne celle où la REOMi est appliquée.

**Lecture :** 4 ans après le passage en REOMi, les collectivités collectent en moyenne 140 kg d'OMR par habitant. L'intervalle de confiance à 90 % de cette moyenne se situe entre 130 et 150 kg par habitant.

Source : Gatier 2016a p.15 ; droite de tendance ajoutée par l'auteur

NB. On pourra constater que, sur le moyen terme, la TI ne produit qu'une amélioration modérée par rapport à la poursuite de la tendance antérieure (écart en année 14 : droite de tendance, courbe bleue). L'introduction de la TI fait malgré tout gagner une dizaine d'années, sur la tendance à la réduction des déchets.

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# RESOURCES AND CAPABILITIES AS ENABLERS OF VALUE CO-CREATION IN SERVICE INNOVATION

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*The paper analyses value co-creation in service innovation. Referring to a systematic literature review, the paper searches the answer to the following research questions: (1) what resources and capabilities should be used to enable both customer and service provider to co-create in service innovation and (2) how these resources and capabilities vary considering each service innovation development stage. The study reveals a deeper understanding of resources and capabilities that should be used for value co-creation in service innovation and allows drawing the conclusion that there is the need for more research in this area.*

## 1. Introduction

In modern economy service companies have to continuously reinvent themselves in order to adapt to a complex and dynamic business environment. In this respect, innovation is a major source of service firms' progress and success. Innovation normally refers to new service products introduced in an established service sector. These innovations include new services, new service provision processes, new organizational structures, or marketing strategies (Lapenta, 2017). Moreover, service innovation can be regarded as a set of improvement in technology innovation, business model innovation, social-organizational innovation, and demand innovation with the objective of improving existing services, creating new value propositions, or creating new service system (Bishop et al., 2008). Service innovation is treated as the primary source of value creation, particularly in areas that involve creating value for customers (Chen et al., 2016). The involvement of the customer in value co-creation is a prerequisite for a service firm to become and remain competitive (Saarijärvi et al., 2013; Schertzer et al., 2013). Thus, more and more firms expand their innovation activities through co-creation (Mahr et al., 2014). From value co-creation perspective, service providers and customers interact reciprocally for the development of new services, products, solutions, and other new business opportunities (Galvagno and Dalli, 2014). Despite this important fact, the studies on co-creation in service innovation are scarce (Frow et al., 2015; Islam et al., 2015), and the question what conditions under which value co-creation leads to successful innovations are (Gemser and Perks, 2015) remains underdeveloped. In this paper we focus on customer and service provider's resources and capabilities that play the role of enabler in value co-creation during service innovation. According to a traditional

distinction, resources are divided into operand resources and operant resources (Edvardsson et al., 2013; Vargo and Lusch, 2004). Service innovation relies more on operant resources than on operand resources (Chen et al., 2009). Hsieh and Hsieh (2015) accentuate the operant resources as a facilitator of service innovation. But possession of resources is not enough; a firm's competitive advantage resides in its ability to manipulate resources and capabilities into value co-creation processes (Kim et al., 2015), hence service innovation. Nevertheless, what capabilities are required to successfully manage co-creation remains underdeveloped (Lindgreen et al., 2012) and very little is known about the types of resources that companies seek for the purpose of service innovation (Rusanen et al., 2014). Thus, the aim of this study is to enrich the understanding of resources and capabilities as enablers of value co-creation in service innovation and to outline the future research lines. The research questions are the following: (1) what resources and capabilities should be used to enable both customer and service provider for co-creation in service innovation and (2) how these resources and capabilities vary considering each service innovation development stage?

The rest of the article proceeds with four parts. First, the theoretical background to resources and capabilities in the context of value co-creation and service innovation are discussed. Second, the methodology and research design used collecting and analysing the relevant scientific articles concerning value co-creation, service innovation, resources and capabilities are described. Next, the results are presented and the key findings are discussed. The article concludes with the final remarks and outlines of future research.

## **2. Theoretical background to resources and capabilities**

The process of creating service innovation can be strengthened when resources are integrated in value creation processes (Nam and Lee, 2010). Resources are divided into two categories: operand and operant (Hsieh and Hsieh, 2015). Operant resources are of particular importance in creating innovation (Lusch et al., 2008). The degree of service innovativeness depends on organisation's ability to use operant resources (Michel et al., 2008). Both organisations and customers are resource integrators (Vargo and Lusch, 2008; Sharma et al., 2014) and value co-creators (Vargo and Lush, 2004). Value co-creation is defined as an interactive process involving at least two willing resource-integrating actors (Payne et al., 2008), focusing on three elements that lead to service innovation – the provider's sphere, the customer's sphere, and the joint sphere (Grönroos, 2008). Customer operant resources can be used in value creation for an organisation (Sharma et al., 2014). Customers are involved in value co-creation through the process of resource integration (McColl-Kennedy et al., 2012). They need knowledge and skills, i.e. operant resources (Sharma et al. 2014), while organisations have to develop the ability to facilitate the resource integration process and customer learning (Arnould and Thompson, 2005; Hibbert et al., 2012).

Customer participation affects service innovation (Matthing et al., 2004; Ordanini and Parasuraman, 2011; Prahalad and Ramaswamy, 2004). As a result, innovation creation costs are reduced and service quality is enhanced (Ramaswamy and Gouillart, 2010; Tanev et al., 2011). However, customer role in service innovation remains poorly researched (Alam, 2011; Ostrom et al., 2010). Scientific literature has

not revealed what resources and capabilities are necessary for an organisation to facilitate customer participation in building innovation (Sharma et al. 2014).

There is surprisingly little research which combines resource-based view and service innovation (Kim et al., 2015). The resource-based view states that firms' resources and capabilities are main components in creating an innovation strategy (Barney 1991; Bharadwaj 2000; Grant 1991; Ray et al. 2004, Kim et al., 2015). A resource is anything that has the potential to be operated or used by actors to enable and foster their resource integration and value co-creation efforts (Edvardsson and Tronvoll, 2013). The combination of various resources with the firm's internal knowledge allows companies to generate knowledge that turns into innovation (Teece, 2014). Firms' resources should be valuable, rare, inimitable and non-substitutable (Barney, 1991), hence, not easily duplicated by competitors (Hart, 1995). However, resources are easily transferable between organizations (Wu et al., 2016). Therefore, companies need to transform their resources into capabilities (Makadok, 2001). Capabilities are a firm's capacity to use its resources in order to achieve a desired end (Amit and Schoemaker, 1993). In other words, it is competencies that are built by combining resources (Grant, 1991). Hence, capabilities are enabled through the utilisation of resources (Carroll and Helfert, 2015). Companies require organizational, static, and dynamic capabilities (Urueña et al., 2016). Organisations have to strengthen their capabilities to create service innovation by employing customer resources (Nam and Lee, 2010). Customers are the main sources of external information and value co-creators in creating service innovation (Nam and Lee, 2010). Customer participation in creation of innovation can improve the relationship between the organisation and the customer (Alam, 2006).

To summarize, customer and service provider's resources, especially operant resources, and capabilities are crucial to value co-creation in service innovation development; however, there is still a lack of knowledge in this field.

### 3. Methodology and research design

This study uses a systematic literature review and approaches resources and capabilities as enablers of the value co-creation in service innovation. A systematic literature review is defined as a review of a clearly formulated question that uses systematic and explicit methods to identify, select and critically evaluate relevant research and to collect and analyse data from the studies that are included in the review (Booth et al., 2016). Systematic reviews improve the quality and outcome of the reviewing process by employing a transparent and reproducible procedure (Tranfield et al., 2003). We followed a three-stage procedure: planning, execution, and reporting. During the planning stage, the objective of the research and the key data sources were identified. The execution of the systematic review consisted of the following stages: (1) identification of keywords and search terms, (2) grouping of the results, (3) results analysis.

The systematic literature search in our study was carried out by the article authors during the spring of 2017 utilizing *Scopus* and *Web of Science* databases. In order to include appropriate articles in the review process, the title, abstract or key-words had to have the keywords concerning value co-creation, service innovation, resources and capabilities. The articles selected meet the following criteria: (1) the articles published in peer-reviewed journals, (2) the articles with accessible full text, and (3) the time period of their publication (2007 - 2017). Working papers, viewpoints,

conference proceedings, dissertations, book chapters, articles in the press as well as articles not published in the English language or published before 2007 were excluded.

Ten articles were selected for the final analysis of the resources and capabilities required for co-creation in service innovation. The articles were grouped as follows: 3 articles were conceptual and 7 presented the data of empirical researches. These were performed in B-2-C sectors such as health care, e-health, etc. and B-2-B sectors such as knowledge intensive business services, technical services, etc.

## **4. Main findings and discussion**

### **4.1. Resources as enablers of value co-creation in service innovation**

Plé (2016) identified 12 types of customer resources which might be used in co-creation process. They are the following: informational resources, emotional resources, physical resources, financial resources, temporal resources, behavioural resources, relational resources, social resources, cultural resources, role-related resources (role size, role awareness and role clarity), customer ability and customer willingness. The author proposed a conceptual model on how service employees integrate customer's resources in an interactional co-creation process, depending on the employee-customer interaction context, employee's own emotions, cognitions, and action. The used resource integration process consists of three steps described as follows: (1) employee accesses customer resources, (2) adapts accessed resources, also, their own resources and (3) integrates the adapted resources.

Aarikka-Stenroos, L. and Jaakkola, E. (2012) define the resources and roles of service providers and customers. The authors identify the following service provider's resources: expert knowledge, which includes specialist skills and techniques, project management skills, and customer understanding; diagnosis skills, such as a proactive attitude, reaction ability and willingness, confidence, and ability to foresee risks; facilities and professional equipment; experience, which consists of accumulated knowledge, ability to see larger patterns, and ability to structure the process; objectivity and integrity; ethical codes; relational capital, which reveals itself through relations to actors with complementary skills. Then, the six types of customer resources are indicated: information on needs, which consist of requirements, goals, schedule, budget; information on context, which includes operational environment, previous solutions; industry expertise, which is special knowledge of industry, conventions and regulations; production material, such as existing solutions and materials; effort and time; financial resources. Customer resources are crucial in the value co-creation process in order to achieve successful outcomes; however, they are difficult to harness (Aarikka-Stenroos, L. and Jaakkola, E., 2012). This study increases the understanding of the resources of both suppliers and customers for value co-creation.

Islam et al. (2015) conceptualize value co-creation and propose a framework of value co-creation for service innovation in academic libraries. The framework consists of the following two parts: (1) the library sphere (with library value-creating processes) at the top and (2) the user sphere (with user value creating processes) at the bottom. Co-creation happens in the middle joint sphere, where interaction and encounter

processes take place between the library and the user(s). The authors state that the library sphere consists of tangible and intangible resources, such as employee experience or skills, departments or services; systems or technology; collections – printed and electronic; facilities; etc. All these resources enable the library to create value for the user by providing services and working to meet user needs. While, the user sphere consists of resources such as need/want/demand, experience, loyalty, potential, etc.

Kim et al. (2015) suggested a new research framework, which involves resources and capabilities and showed how they influence service innovation. The authors made a theoretical contribution to service innovation by showing how firms can create service innovations through a dynamic service capabilities framework. The research framework explained how firm's resources and capabilities together with relational capabilities enable service innovation. Kim et al. (2015) emphasised that resources and capabilities cannot be separated from each other. They define resources as firms' assets, capabilities, organizational processes, firm attributes, information, and knowledge. The two main categories of resources were identified: property-based resources and knowledge-based resources. Further, property-based resources were classified as discrete and systemic and knowledge-based resources were classified as functional and organizational. Property-based resources are firms' tangible and intangible assets, such as intellectual property, contracts or physical infrastructure. Discrete property-based resources are defined as firms' intangible resources protected by a law and not easily duplicated by rivals. Systemic property-based resources are not imitable and a part of a network or system. While knowledge-based resources are defined as firms' ability to manage its competences, and they can be divided into two categories: functional and organizational. Functional knowledge-based resources are firms' specific technical, functional and creative skills related to the firm's processes, and organizational knowledge-based resources are organization's style, culture, vision, traditions, leadership, etc., as well as the ones referring to the knowledge and information exchange activities through various communication channels

Hsieh and Hsieh (2015), by applying service-dominant logic and resource-advanced theory, revealed how the use of operant resources can facilitate the creation of service innovation. The authors accentuated the importance of the dialogue between the organisation and the customer, which supports the opinion of Prahalad and Ramaswamy (2004) who state that organisations and customers are equal as problem-solvers. Co-creation is defined as a dialogue between the organisation and the customer. The research by Hsieh and Hsieh (2015) shows that such dialogue can strengthen the relationship between the organisation and the customer. It is an effective means for a customer to pass the relevant information and tacit knowledge, which is particularly significant for the creation of service innovation. Thus, the organisation's customising capability, which is strengthened by dialogic co-creation, is identified. It can be stated that the relationships between the organisation and the customer influence service innovations, especially emphasising that good relationships between the parties in creating service innovations improve the results. The study revealed that dialogic co-creation can provide an organisation with additional external resources which are necessary for the creation of service innovation. According to service-dominant logic, customers are the main operant resources (Vargo and Lush, 2004). Astute and experienced customers are human resources that employ other operant resources to act (Lusch et al., 2007). Dialogue in the co-creation process affects relational, informational and organisational resources which facilitate the creation of service innovation (Hsieh and Hsieh, 2015).

The authors stated that customizing capability could facilitate the returns of service innovation by effectively integrating customer needs into the service offerings. Consequently, innovation outcomes that companies offer will be more appropriate for customers. Knowledge valuation of customers' input can advance service innovation because customers' tacit knowledge is a crucial resource for innovation. The study confirms that good relationships between the service provider and the customer positively affect service innovation outcomes. Thus, organisations have to apply dialogue in co-creation to create service innovation.

Rusanen et al. (2014) name creativity, knowledge, experience, and skills as resources. Innovation studies stress the significance of resources that reside outside, not inside, the firm. This means that an organisation should find and co-opt the resources from customers, partners, suppliers, etc. According to Rusanen et al. (2014), in service innovation studies information, knowledge and technology are usually cited as external resources when other types of resources are seldom identified or elaborated on. Based on findings from multiple case studies, Rusanen et al. (2014) derive a three-dimensional theoretical model that discloses how service innovation re-sources – general information, ready-made resources, confidential information and tacit knowledge – are accessible through different types of relationships – social contact, arm's length relationship, close exchange relationship and development relationship. Moreover, their investigation provides a comprehensive picture of how resources for service innovation are accessed using absorption, acquisition, sharing and co-creation as access strategies.

#### **4.2. Capabilities as enablers of value co-creation in service innovation**

Urueña et al. (2016) investigated organizational capabilities that are required for the eHealth innovation projects. The research explored how organizational capabilities contribute to eHealth innovation projects from a pilot stage to the implementation itself. The authors identified four types of capabilities: evaluation, collaborative leadership, stakeholder networking, and organizational flexibility.

Kazadi et al. (2016) examined specific capabilities related to co-creation during the innovation process with multiple stakeholders. The authors identified four capabilities which occur in two distinct phases: before a project starts and during a co-creation project. Two capabilities were identified during the first phase; these capabilities are networking capacity and stakeholder competence mapping. Firm's networking capability reflects the ability to find and attract suitable stakeholders for co-creation activities. This capability includes communicating about innovation partner selection criteria and types of collaboration partners needed, and individual skills, such as networking skills, and individual networks. Also, this capability was mentioned by Perks and Moxey (2011). The second capability identified is competence mapping, which reflects a firm's ability to structurally map the competences of various stakeholders. The routines identified in this capability are regular meetings with stakeholders and documentation of competence assessment. Also, there is a need to have some individual skills, for instance, knowledge of stakeholder organization internal works. Further, in the second stage, project co-creation capabilities enable firms to manage specific difficulties of stakeholder co-creation. The first is stakeholder relational capability, which shows the firm's ability to manage relationships with different stakeholders during a co-creation project. The relational capability consists of routines, such as trust building, goal identification, conflict

management, top management resource allocation and preparation of internal workforce for openness and individual skills, for example, openness. While, the second capability stakeholder knowledge management reflects the firm's ability to capture the relevant knowledge generated during the co-creation activities. This capability is composed of information sharing routines and individual skills, such as absorptive capacity.

Sharma et al. (2014) applied the dynamic capability theory in the context of co-creation to define what capabilities are required in the provider's, the customer's and joint spheres. The authors distinguished four categories of organisational capabilities that improve customer participation: customer activation, organisational activation, interaction capabilities and learning agility. Customer activation embraces customer needs sensing (Teece, 2007), mobilising customers, customer identification and utilising customer-initiated efforts (Sharma et al., 2014). The identification and development of corresponding organisational resources or capabilities facilitating customer's value co-creation are defined as organisational activation (Sharma et al., 2014). Customer participation in co-creation is affected by direct interaction (Grönroos, 2011). As a result, organisations have to strengthen interaction capabilities (Sharma et al., 2014). The joint sphere is defined as a platform for co-creation, the result of which can be co-creative or co-destructive; therefore, an organisation should be able to learn about customers, apply knowledge and, depending on the information received, reconfigure resources. This capability is defined as learning agility. The first two categories – customer activation and organisational activation – reflect an organisation's capability to motivate and prepare both parties – service provider and customer – to meet in the joint sphere and to integrate their resources in the co-creation process when creating innovation. It must be ensured that the parties have sufficient resources to participate in this interaction. The third category, interaction capabilities, fosters an effective dialogue between the organisation and the customer. The fourth category, learning agility, shows the organisation's capability to identify and implement innovative solutions (Sharma et al., 2014).

Giannopoulou et al. (2014) try to answer the question how an organisation can reinforce creativity in developing innovative services. Any innovation requires creativity; therefore, creativity is an integral part of service development. It is noteworthy that creativity covers all aspects of the service innovation process starting from an idea and finishing with the launch of a new service. Giannopoulou et al. (2014) synthesised creativity reinforcing practices in order to propose capabilities enabling creativity in the NSD process. The involvement of creative customers was mentioned as a good practice for creativity. The research shows that having direct client interaction is seen as an important source of new ideas for service innovation. Moreover, it is really important to involve the customer in the ideation stage as early as possible to fuel the creation of prospective solutions.

### **4.3. Results analysis and discussion**

According to Vargo and Lusch (2008); Sharma et al. (2014), both service provider and customer are resource integrators. Thus, it is very important to examine what resources and capabilities are enablers of value co-creation in service innovation.

When analysing customer activation, organisational activation, interaction capabilities, learning agility, networking capability, competence mapping capability, relational capability, knowledge management capability, evaluation capability,

collaborative leadership, and organizational flexibility capabilities (Sharma et al., 2014; Kazadi et al., 2016; Urueña et al., 2016) required for co-creation in service innovation, it was established that the main scientific studies had been performed in the B-2-C sector, which includes health care and e-health sectors in Europe and Australia while creativity (Giannopoulou et al., 2014) and the capability of customization (Hsieh and Hsieh, 2015) had been studied in B-2-B sector. All the authors discussed the capabilities as present inside organizations. The capabilities were analysed only from the service provider's perspective. The process of the identification of the capabilities necessary for the creation of a new service revealed that customer activation, organisational activation, networking, competence mapping and evaluation capabilities are necessary at the early stages of NSD. And then, capabilities required for the implementation stage are interaction, learning agility, relational capability, knowledge management, collaborative leadership, networking, and flexibility. Another important capability in service innovation is creativity which is required not only for idea generation, but also for the development or even the launch stage.

The analysis of resources led to determining the following service provider's resources: experience, skills, relational resource, informational resource, human resource, organizational resource, knowledge, diagnosis skills, facilities and professional equipment, objectivity and integrity, and ethical codes. These resources were identified when performing research in B-2-B sector which included high-tech manufacturing industry, where customer expertise is crucial for service innovation, technical services and knowledge intensive business services.

On the basis of the data in conceptual papers, the following service provider's resources can be singled out: blueprints, intangible resources, intellectual property rights of assets, discrete property-based resources, intangible assets, fixed assets, physical capital resources, tangible resources, systemic property-based resources, physical IT infrastructure, technical resources, generic information technologies, human capital resources, skills, discrete knowledge-based resources, technical IT skills, cultures, organizational capital resources, managerial competencies, systemic knowledge-based resources, IT-enabled intangibles, and shared knowledge.

The authors accentuated the following customer resources necessary for co-creation in service innovation: information on needs, information on context, industry expertise, production material, effort and time, and financial resources. These were identified having performed research in B-2-B sector, in various industries. According to the data from conceptual papers, the authors distinguish other customer resources such as informational resources, emotional resources, physical resources, temporal resources, behavioural resources, relational resources, social resources, cultural resources, role-related resources, customer ability, customer willingness, experience, loyalty, and potential.

According to Edvardsson et al. (2013); Vargo and Lusch (2004); Hsieh and Hsieh (2015), resources are divided into operand and operant. Thus, service provider's operand resources could be facilities and professional equipment, fixed assets, physical capital resources, tangible resources, tangible assets, and technical resources while other service provider's resources such as experience, skills, relational resource, informational resource, human resource, organizational resource, knowledge, diagnosis skills, objectivity and integrity, ethical codes, etc. are operant resources and can be defined as facilitators of service innovation (Chen et al., 2009; Hsieh and Hsieh, 2015; Lusch et al., 2008), hence value co-creation (Sharma et al., 2014). Moreover, customer resources could also be divided into operand and operant. Operand customer resources are production material, financial resources,



and physical resources while operant resources are information on needs, information on context, industry expertise, effort, time, emotional resources, temporal resources, behavioural resources, relational resources, social resources, cultural resources, role-related resources, customer ability, customer willingness, experience, loyalty, and potential.

To summarize, it is possible to state that the use of appropriate customer and service provider's resources and capabilities could enable value co-creation in creating service innovation. In other words, organisations could achieve success in service innovation, then integrate suitable customer and their own resources, and use proper capabilities for value co-creation, which occurs at each stage of service innovation development.

## 5. Final remarks and future research lines

To conclude, this paper makes a few specific contributions to the literature. Our main contribution in this paper is the analysis of a body of knowledge on resources and capabilities required for value co-creation in service innovation. We identify and analyse resources and capabilities which enable both customer and service provider to co-create value in service innovation. Our second contribution is the application of a specific and transparent scientific literature review method. Finally, we provide the limitations that create opportunities for future research.

Resources and capabilities play a significant role in this field. However, a systematic review of the scientific literature on resources and capabilities required for value co-creation in service innovation shows that this area is poorly studied. Thus, the space remaining for future research is quite wide. On the basis of the analysis we would like to conclude with the limitations and some lines for future research. Several limitations of this study can be identified in relation to the technical aspects of conducting the scientific literature review. A systematic literature review as a method is limited in that it does not cover the whole body of knowledge related to a specific phenomenon, as it is limited to a select number of keywords. Also, books, book chapters and conference papers were excluded even knowing that some of them may have had a significant impact on the domain (Mustak et al., 2013). In addition, the review includes articles published only in the English language; hence, studies in other languages were excluded. Another limitation of this study is the number of databases (two) chosen for the review. In order to include more relevant papers in the review, future research should cover more databases such as *Academic Search Complete*, *Business Source Complete* (EBSCO Publishing), *Science Direct*, *Emerald Insight*, etc.

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# SENSITIVE, NETWORKED PROFESSIONAL - SERVICE ADVISORS AS AGENTS BETWEEN CITIZENS AND DIGITALIZED SERVICES

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*Social and healthcare services are in major transition, in which service integration and digitalization may produce more meaningful, better and efficient services for the citizens. The paper analyses new forms of an emerging profession, called service advisor, which is an example how employees may become proactive authors of their own working roles. Three types of authorship were found from the qualitative data: 1) the proactive caretaker and co-creator, 2) the sensitive service integrator and interlocutor, and 3) the digital guide and snag solver. Providing flexibility and autonomy to the employees to modify their roles is significant for their organizational authorship and proactive behaviour to emerge.*

## 1. Introduction

Hopes are currently high that digital platforms will help make social and health care services more paperless, efficient, citizen-oriented, and integrated. Previous research on the adoption of e-services has indicated that citizens' digital skills and readiness for digital communication play a crucial role in how the work of service providers are organized (Berger, Hertzum and Schreiber, 2016; Åkesson and Edvardsson, 2008; Breit and Salomon, 2015). From the perspective of service providers, digitalization will radically change their work tasks.

The aim of the paper is to outline and understand what the work of a new professional, the service advisor, will involve in the rapidly changing service system. A new kind of professional is needed, one who can promote a kind of "self-service" among citizens as regards using e-services. However, this professional should also strive to prevent exclusion from these services of those who have no competence or possibility to use digital interfaces, by providing them with face-to-face service.

Service advisors work as pioneers in social and health care districts to help citizens navigate between different services. Because of the ongoing digitalization of services, they have become the borderline personnel between ICT interfaces and citizens. However, when managers have nominated service advisors to help citizens in the complex service system, they have not been aware of what these jobs would entail. This study started from these premises.

The paper is structured in six sections. After the introduction we take a look at literature on organizational authorship as a framework for analysing new professionalism. In addition, we open up how service advising has been approached by previous studies. Thirdly, we introduce the case context and data. In the fourth section we operationalize the analysis framework further and explain the analysis method. In the findings we present the novel service advisor types. Finally, we conclude our findings and ponder their implications to the theoretical discussion and practice.

## **2. Theoretical framework and literature on service advisors**

In the complex, digitalized service environment, the frontline employee's role, which represents dyadic client-employee interactions, is in transition. As IT-enabled service interfaces turn clients into operators of their own services, the diminishing role of employees is reinforced (Rust and Huang, 2014). However, as the face-to-face servant role of service employees may seemingly fade away when the technological interface pushes them into back offices, these employees may be given the opportunity and space to form new agencies and adopt new roles and relations. Case studies so far indicate that empowering and allowing employees to apply their customer know-how and ideas to service innovation increases preconditions for development, improves services, and positively influences their well-being (Hasu et al. 2014; Honkaniemi et al., 2015). Employees may become innovators of new services based on their deep experience with clients; enablers, helping and training clients to use technology; differentiators, giving a genuinely empathetic and personal face to the surface of the service, or co-ordinators, handling integration and building bridges between different offerings (Bowen, 2016).

In at least the implementation phase of e-services, service workers' agency may depend on how quickly and smoothly customers are willing to adopt the role of co-producer of the service, and be guided to increase the use of self-service with the IT system (Breit and Salomon, 2015, Berger et al., 2016). Previous studies of e-government have perceived increases in staff workload because the staff must simultaneously assist citizens in digital communication and guarantee face-to-face service to the most vulnerable citizens, who have neither the competence nor possibility to use digital services (Berger et al., 2016).

Service advisors' new profession providing citizens with front office services either face-to-face or via e-service platforms has not yet been empirically studied much. However, information and computer scientists (Giesbrecht et al., 2016 ; Giesbrecht et al., 2017) have recently identified the problem of how to design employee-empowering e-services. In the following, we raise up few of their notions and insights, which provide contextual understanding of the service advisors work between digital platforms and citizens' needs.

Although local governments have began to provide their services online, more complex requests or requirements of the citizens can rarely be resolved via e-services. Citizens may not identify what are their actual information needs, and they do not then know what to look or search for. In such cases a human advisor is needed to act as an intermediary to help uncover their needs and requirements. (Giesbrecht et al.

2016.) As a result, citizens seek a face-to-face advice in front offices, often named as contact points, providing citizens with integrated access to variety of services.

A challenge for the employee's expertise is to possess knowledge not only on specific service they may have originated from, but on several services. However, the information systems and the orientation of the frontline service workers are often based on enabling simple transactions with a focus on government requirements and effective processing rather than citizen-centric, comprehensive and advisory service delivery model. (Giesbrecht et al., 2016).

When citizen does not identify what kind of help or service is needed, the skill which is needed from the service advisors is a highly sensitive interpersonal and communicative skill. According to previous studies it may have higher importance than his or her specialist knowledge on a particular service (Schuppan, 2014). Employees have to move from an administrator role processing standard transactions to advisors providing comprehensive advisory services. In service advisors' work collaboration and coordination between different service providers becomes an asset. In addition, lack of IT skills influences on how the professional is able to guide citizens to use e-services. (Giesbrecht et al., 2016.)

The studies of information and computer scientists have contributed in bringing understanding of the difficulties in current information systems, the demands of the service concept, and what kind of skills and expertise is needed in service advisor's role in between the systems and the customers. The studies then look for better design of ICT systems and general improvement of employees' expertise. We would like to complement the approach by strengthening the conceptual understanding of employees as developing, intentional and proactive agents.

For the individual worker, building a new work role and crafting a new job in the rapidly changing labour market is not an easy task. In this paper, we use the concept of organizational authorship as a term capturing the currently demanded proactive nature of new professionalism. As a concept, organizational authorship provides a theoretical framework for analysing professionals' experiences as a meaningful, reflexive and sustainable narration of their work (Gorli, Nicolini and Scaratti, 2015). John Shotter and Ann Cunliffe (2003) have argued that a person may become an author of his or her own work setting, when he or she plays an active role in the daily production, reproduction and transformation of the work processes.

How proactive and prosocial behaviour of the employee is emerging has also been theorized by work design theorists Adam Grant and Sharon Parker (2009). They argue that how the contact with employees and their beneficiaries is structured influences on how employees can empathize, identify with and take the perspective of beneficiaries and thus have the opportunity to develop an affective commitments with them. These affective relationships have a strong impact on employees' prosocial motivation, encouraging higher levels of effort, persistence and helping behaviour (Grant 2007). In the analysis framework, this relational perspective is one element we look for.

Originally the authorship was seen to be related to managers' work. However, in rapidly changing organizations, in which new jobs emerge and old ones disappear, the employees have to have the capacity to form their own job descriptions. Sense of authorship is strengthened through discursive articulation and practical reflexivity of one's work experiences and by giving value to the tacit and situated knowledge that



those experiences convey (Shotter 1993). This refers also coping and facing with the messy, political nature of organizations with different relationships and interests. Practical reflexivity enables to evaluate habits of perceiving, thinking, remembering, solving problems and feeling (Cunliffe and Easterby-Smith, 2004).

Practical reflexivity is encouraged in the interview situations, because it encourages social actors to see themselves as agents and authors of the organizations in which they live. For the analysis framework based on the concept of organizational authorship, we accent how the interviewee tells how he or she created her work practice reflecting his or her personal agency, and capability to create new practices. Another point taken into analysis framework is relationships to other people, both clients and other professionals, how are they formed and sustained, what kind of feelings they contain. Third element for the analysis framework is to identify 'the institutional arrangements and the material artifacts' (Gorli et al., 2015, 22) at hand for the professional to reconstruct his or her authorship in the organization.

Based on the previous studies on service advisors' work (Giesbrecht et al., 2016 ; Giesbrecht et al., 2017), we added to the analysis framework two points to be evaluated; critical knowledge and competence as the first one, and communicative, interpersonal skills and strategies for the second. Our analysis framework now consists of six elements:

Table 1: Theoretical and research-based analysis framework

<b>Analytical element to evaluate from the interviews</b>	<b>Theoretical origin</b>
Critical knowledge and competence	Previous studies on service advisors
Agency, reflexivity	Organizational authorship
Relations, to citizens and to professionals	Organizational authorship
Interpersonal, communication strategies	Previous studies on service advisors
Tools and aiding artifacts	Organizational authorship
Local physical context	Organizational authorship

### 3. Case context and data

Our case context is the South Karelia Social and Health Care District (Eksote), which is located in rural South Karelia Region in Eastern Finland. Eksote is responsible for the whole (integrated) social and health care in the region, involving 132.000 population, 450 M€ budget and 4600 employees. The challenges involve rapidly aging population and low population density: in 2021 the estimated share of people over 65-year in peripheral areas of the region is 35-41%. Unemployment is relatively

high in the region, and social and health problems tend to accumulate when unemployment is prolonged.

Because of the challenging situation, Eksote intensively develops social and health care work and tests new integrated operation models and solutions through different development projects, for example client-oriented processes for rehabilitation of people suffering from memory disorders. Eksote includes expertise and resources of private and third sector actors in the development processes, and implements digital interfaces, systems and solutions for residents' own use. Eksote also encourages more independent use of services. Prevention of health problems and self-sufficiency at home of the elderly population is the core strategy of Eksote. Due to this strategic reorientation, multiple changes in the service system are ongoing. Eksote is a national forerunner in organizing social and health care services in a novel way, and currently it is also increasing its e-services and implementing a new digital strategy.

In addition to providing the social and health care services in eight wellbeing centers, Eksote increasingly produces mobile and electronic services. Electronic services are being provided in the Hyvis.fi service portal. Every citizen has an access to HYVIS-portal. Through the HYVIS, a professional and a customer can contact each other in their cases. HYVIS provides a possibility to reserve an appointment to the physio-therapist, public health nurse, dentist, child welfare clinic, or laboratory tests. Social work can also take advantage of HYVIS-portal. Customer may submit applications or attachments to service advisor via HYVIS. Residents are still on their way to find the HYVIS-portal and its benefits. Simultaneously the functionality of the HYVIS is developed.

Support for the use of renewing services and digital channels such as the HYVIS-portal is a topical matter in the region. Special job description of new type of service advising practice is currently taken under consideration. Currently recruited special service advisors work in eight wellbeing centres, in which services are provided on the basis of the needs and age structure of the population of each service area.

Data were gathered in three phases in 2016. First we interviewed five service advisors. The second source of data was ethnographic observations in two wellbeing centres and during the fieldwork two doctors, a nurse and a customer were interviewed briefly. The last phase was a feedback workshop for employees and managers on the everyday work of service advisors. All the interviews and the workshop discussions were audio-recorded, transcribed and memos with reflections were written. Ethnographic observations were written into a field report.

#### **4. Methods and analysis**

In the service advisor interviews, we applied the 'instructions to the double' technique (Ivaldi, Scaratti and Nuti, 2015). The professionals were requested to imagine having a double, who would take their place at work the next day and their task was to advise this person on 'what to do' and 'what not to do'. The purpose was to help them reflect on their attitudes, routines, intentions, and emotions. The method helps persons make their expertise and tacit knowledge explicit. They may thus review their routines by explaining their everyday actions, and imagine a typical working day.

We sent the instruction as an e-mail about a week before the interview to help them orientate themselves to the situation.

In the interview, we said the request aloud in the beginning, and supported the interviewee then to a very informal and open way of talking. In case, the interviewee did not start the imagining, we used questions, such as:

-Tell us about your background, how did you find this job? Tell us about your typical working day, what do you do first? What kinds of tools you use in your work? Whose help do you need during the day? What kinds of customers you meet? What kinds of tasks you have? What kinds of problems you face during the day? What do you do in the end of the day?

We made all the interviews either in the interviewees' workplace or nearby it. Therefore, we could make notes and take a photo on physical environment along the interviews.

Based on the interviews we chose two different service advisors working in different kinds of locations to be observed. The first one worked near the town center in a wellbeing center, which had various health care services available. The second one worked more in the rural area in a service contact point, which provided nursing service and service advising two days a week. The contact point as a physical location was also used by the third sector, associations which have a preventive purpose. The second author of the paper observed both service advisors' work for half a day. This data gave additional understanding on which kind of clients (with their various problems) the service advisors faced during the day.

After the data collecting, we organized a workshop for all the service advisors and their supervisors, in which we presented preliminary findings from the interviews and conducted a group work. Inspired by the findings their task was to foresee into which directions the service advising was about to develop. This analysis is not yet included in the paper.

For this paper we analyzed each interview more in depth according to the table 1. After classifying each interview, we located them into a diagram based on authorship/ self-service capability of the employees and citizens. We operationalized each class in the following way:

Table 2. Analysis framework and operationalization for the interviews

<b>Analytical element to evaluate from the interviews</b>	<b>Operationalization</b>
Critical knowledge and competence	What service content is known? What kinds of ICT-skills? What kinds of interpersonal skills has? What are the strengths and weaknesses?
Agency, reflexivity	Describe how creates practices and has created his/her job practices. How reflects on the tasks? What kinds of rules or principles follows or bends?

Relations, to citizens and to professionals	How much faces clients face-to-face, on the phone, via e-service? What kinds of problems solves? How contacts are created and sustained to other services and professionals? What kinds of feelings the relations contain?
Interpersonal, communication strategies	What kinds of ways of talking is used with the clients to understand their needs? How is taking care of the relationships to clients/ to professionals? How trust is created?
Tools and aiding artifacts	What kinds of tools uses during the day to remember/ to report? Papers/ ICT-programs for who?
Local physical context	In what kind of physical context is working? Contact point/ wellbeing center? Describe the work space. What kinds of population is in the area? How are other services located?

## 5. Findings

From the five service advisor interviews we could distinguish three types of profiles depending on their educational background, authorship, relations, what kind of tools they used and what kind of local context they worked in. We could posit the profiles into a diagram (figure 1) by evaluating how active and autonomic agents they were in relation to customers' authorship. The most vulnerable customers were served by a proactive caretaker and co-creator service advisor type, who was committed to each client till she or he got help. In turn, sensitive service integrator and interlocutor – advisor type worked with both vulnerable and active citizens mixing social worker role with service advising. The third profile, called digital guide and snag solver, was available in a service contact point for questions and advices for those citizens who were mainly capable of applying services by themselves. In the following, we present the three profiles and provide few excerpts from the interviews to illustrate the differences between them.

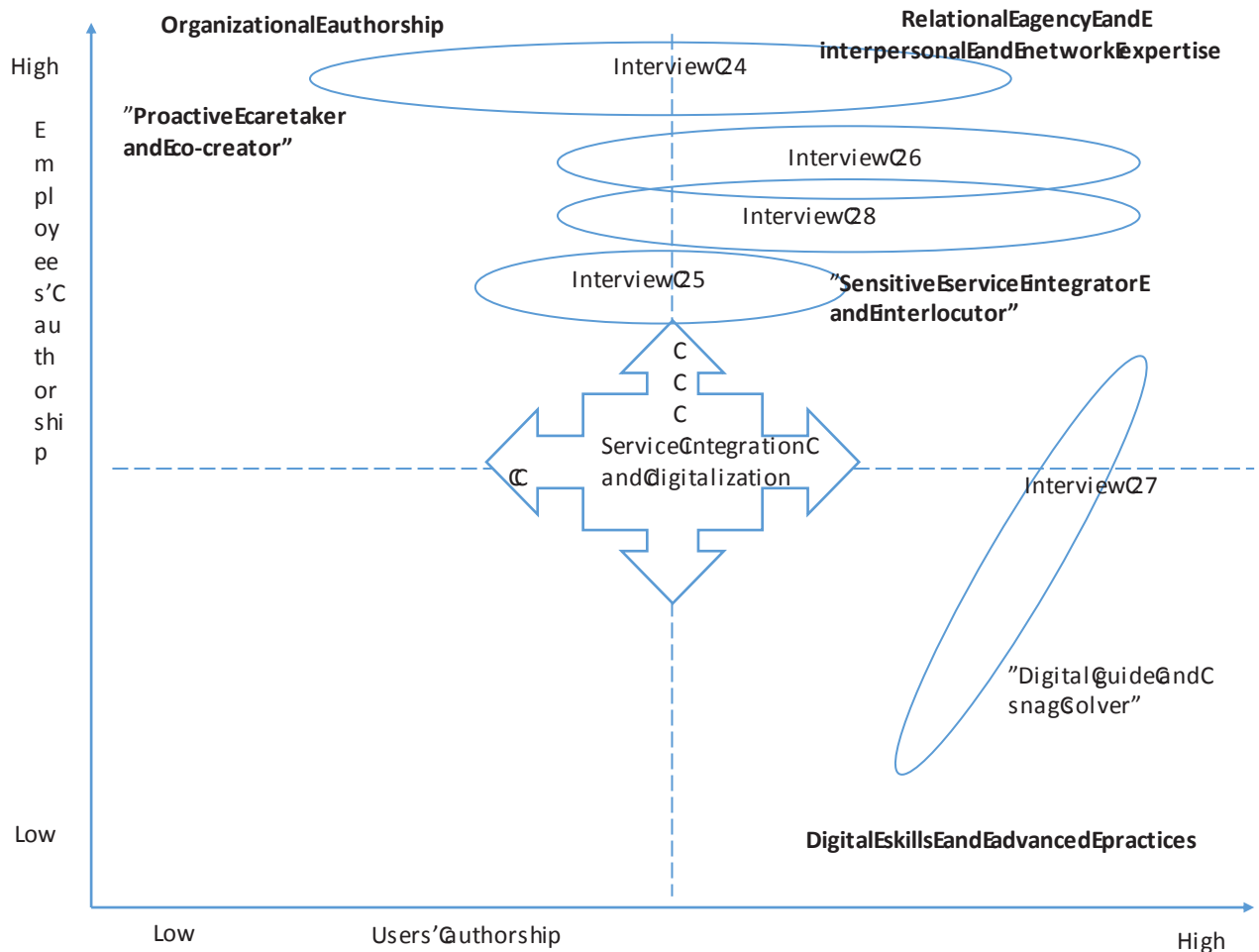


Figure 1. Three profiles of service advisors

The following table describes the features of the proactive caretaker and co-creator – type of service advisor, who takes the highest responsibility on customers’ wellbeing compared to the other types. The nurses’ background gives understanding on the medical state of the customers as well, as the interviewee describes: “My nurse education is very good, because sometimes I find out that the customer has too much medication. Sometimes I reserve a doctor’s appointment from the desk myself and I refuse to go away before the appointment is reserved.” The attitude of the service advisor is to fight for the better service for the customer.

Table 3. Proactive caretaker and co-creator

Analytical element	Description
Critical knowledge and competence	Education from both health care and social services. Most dominant expertise is on interpersonal and communication skills. Not very ICT enthusiastic, but can cope with the health record systems.
Agency, reflexivity	Has created her job from scratch, by observing and grabbing customers from the reception desk. Has created new practices to find and handle outcast citi-

	zens. Is very devoted to her work and helping customers comprehensively, and till he or she gets in to another service. Very proactive way of working. Reflects well on her role and tasks and can compare it to others.
Relations, to citizens and to professionals	<p>Serves face-to-face mainly disordered citizens or their relatives, who need several services and are in some kind of crisis. Their digital skills are tenous and they may not know what kind of services are available or are reluctant to receive them. Serves younger customers on the phone, but often invites them to face-to-face contact.</p> <p>Has good personal relationships to service centers and day activity service for the elderly based on her previous work history in them. Consults frequently the nurses and MDs of the wellbeing center and social service for the adults. Ponders what to do with the client together with other professionals. Solves conflicts between the staff and the clients and their relatives. Not actively connected to other service advisors.</p>
Interpersonal, communication strategies	<p>Adjusts her way of talking to customers depending on their personality. Scans indirectly the life style and circumstance of the client by chatting in a familiarly, friendly way with him or her. Accompanies clients' opinions and is emphatic. Tracks the client to know what is going on in his or her life.</p> <p>Asks regularly if other professionals in the wellbeing center need any help or if they have any disordered clients around.</p>
Tools and aiding artifacts	Writes notes during the appointments to post-it papers and writes reports as narratives into Efficca – patient record system. Prints out documents from the system and pastes her notes into them to remember the specific customer.
Local physical context	Works in the middle of a wellbeing center in a town-like district, which serves over 27 000 population. Has a desk of her own, but moves around the building during the day, depending on where help is needed. Service center for the elderly is nearby.

The caretaker acts very actively to find customers. By observing customers in the reception desk, she could foresee who would need service advising. As the interviewee explained: "I just went and collected (my clients) from the desk. I looked

at the customers in the reception room and pointed out to the nurses that, that one looks like she could come to meet me after the doctor's appointment." (interview 24)

Most of the caretaker's clients do not have the capability or devices to use digital services, even if they were younger, their circumstances are such that they can not use them for financial or other reasons, as the interviewee describes: "Most of the people who are my customers just are not capable enough.// Younger ones with mental health problems or alcohol problems cannot. They do not have the computers or such, they might have prepaid telephone connection, which is valid only a week every now and then." (interview 24)

The communication strategy of the caretaker is to chat with the customer in a friendly way, ask indirect questions about his or her way of living, as an interviewee describes the way of talking with a customer: "so are you from this town originally? Do you have relatives here? What kind of work you have done? Do you know anybody? Do you have hobbies? And so.. What kinds of neighbours you have? And when I hear from which part of town is living in, then, where do you go shopping, and how do you go there?.."// Interviewer: And you make conclusions? Yes, I write down, and go on, it takes time but.."(interview 24)

The second service advisor profile is called sensitive service integrator and interlocutor. Three of the interviews represent mainly this profile and all of these interviewees work in a wellbeing center, which provides extensive health care services, but not social services yet. Typical for the interviewees was that they had a basic education from another human-related sector, but had then educated themselves into social work. Compared to the caretaker profile, the sensitive service integrator works more in collaboration with other professionals and the customer flow comes through them, not by searching customers by themselves. The following table describes the main features of the profile.

Table 4. Sensitive service integrator and interlocutor

Analytical element	Description
Critical knowledge and competence	Wider educational background (not in health care) and has changed into social service work later in his or her career. Enjoys working with people, having a sensitive touch in hearing their problems. Social worker role is mixed with service advisor role. Most dominant expertise is in encounters. Not interested in ICT systems, and admits having lack of skills and lack of time in learning to use them.
Agency, reflexivity	Has gained a valued position in handling difficult cases among the professionals of the wellbeing center. Customers are directed from MD's and nurses' appointments to the service advisor. Is invited to other professionals' meetings. Has become a conflict resolver between professionals as well. Has ideas on developing services into more preventive direction based on social work or previous education. Reflects

	on the diverse tasks of the job in a fine-tuned way.
Relations, to citizens and to professionals	<p>Customers need multiple services, and are in some kind of crisis. Creates a trustful space for customers to tell about their life and problems, listens very sensitively and asks additional questions. Has skills to empower the agency of the client by listening and supporting him or her like an equal, not like a patient.</p> <p>Professionals are relieved because the service advisor saves their time, by having time to encounter the client and by knowing how to guide into other services and how to write successful satisfactory statements to the applications.</p>
Interpersonal, communication strategies	Allows clients to open up, starts by small talk, or asking about the reason for doctors' appointment. Broader understanding of the customers' anxiety becomes helpful, often discussions become therapeutic to the clients as such. Social worker approach and methods are used.
Tools and aiding artifacts	Fills in the applications on behalf of the elderly customers. Uses e-mails and Social Efficacy –system. Does not have an access to the health care records, so makes notes on separate papers or by computer with word program. Takes paper forms to home visits.
Local physical context	Has a room of his or her own nearby the reception desk of the wellbeing center. Moves around the corridors and meets other professionals in the coffee breaks and lunches. The door is knocked all day long. The population is mostly elderly people.

Their social worker role is mixed up with the service advisor role in practice. In that sense they themselves represent service integration. The social workers' and other educational background provides the profile with new ideas to help their customers, for example an interviewee described: " I have had a permission from my supervisor to try and practice a new task: how to conduct motivating discussions. // it is a kind of social work. In my previous job I learned to conduct a series of discussions, 5-6 times, in which a problem of the customer is tackled with, such as an addiction or whatever problem the customer needs a change for." (interview 28).

The challenge for the sensitive service integrator is how to keep up with the digital skills, as an interviewee describes: „The biggest challenge for me is the digitalization, I admit, I need personal guidance to it myself, because my customers are mainly elderly people, so I alienate from it myself." (Interview 26).

Other professionals in the wellbeing center guide their patients to the service advisors' appointment and ask the advisor into their meetings as an expert of different services, as described: " Most of my customers are the other professionals



or come through nurses and doctors. On my typical day 3-5 professionals have asked something from me before half past eight.// Our instructor doctor ask me to join their meetings without any exceptions.“ (Interview 26)

The service advisor becomes interlocutor for both professionals and customers. Many customers become longterm acquaintances who find their way to the service advisor themselves, as the following excerpts depict: “If I go around in the neighborhood, the guys may ask: when are you available? I should come to meet you.“ (interview 25)

The third service advisor profile is called digital guide and snag solver, who works in a contact point. One interview represents this profile. She has the best digital skills compared to other types, but more reactive way of encountering the clients than the other types: as the interviewee describes: When someone arrives here, I listen and evaluate what kind of help he or she needs, then I decide what kind of help is needed, medical or social.// then we may print out his applications and I may fill it with the customer. I ask and write down.“ (interview 27).

Table 5. Digital guide and snag solver

Analytical element	Description
Critical knowledge and competence	Education in health care and in adult social services. Work history in social services. Uses several ICT systems fluently and is able to guide customers in using them.
Agency, reflexivity	Works in two positions: two days a week as service advisor and three days as a social worker. Easy to adapt into a new hybrid advisory role. Keeps the door open for enquirers, advises citizens in their welfare applications and guides them to use HYVIS-portal. Has a positive attitude towards e-services. Organized but reactive way of working.
Relations, to citizens and to professionals	Customers from the neighbourhood actively enter or call the contact point. Forms a work pair with a nurse. Together they access both health and social care records of the client and may serve the client comprehensively. Occasional contacts with other professionals by phone. Not actively connected to other service advisors.
Interpersonal, communication strategies	The strategy is to listen to the client, and then evaluate what is needed. Writes the applications and searches information on behalf of the clients by asking questions. Is subtle, helpful and fluent in the customer contacts.
Tools and aiding artifacts	Multitasking is a natural part of the work duties. Writes her notes on customers directly to the electronic records. Uses Excel and Effic. Skype for business is in

	daily use with her work mate. Encourages clients to register to HYVIS –portal system.
Local physical context	Contact point is a small building in the suburbs. Service advisor’s office is opposite the lobby and next to the nurse’s room. Customers are taken with and without appointments from the lobby as they arrive. Third sector services use the same space for their meetings.

The digital guide – service advisor encourages clients to register to the digital portal, as she explains: “It is demanded that they register into Hyvis, and then inform me by e-mail that he or she has registered. Then I add the customer to the system and the access is available for him or her.// I increasingly guide customers to use it, I even made a handwritten instructions how to do it.” (interview 27). Since the service advisor is two days a week in the contact point, there are enough enquirers. It seems they were served quite quickly or directed to the nurse if needed.

To sum up, we outlined three types of authorship from the data: 1) the proactive caretaker and co-creator, who takes care of the client comprehensively, 2) the sensitive service integrator and interlocutor, who collaborates smoothly with other professionals, and 3) the digital guide and snag solver, who uses digital systems and also assists customers in their use.

The analysis indicated that the authorship of the service advisors depends on their relations with other professionals and customers. The most vulnerable groups of citizens, with multiple needs for various services, were sometimes only reached via home visits after a hint from a relative or neighbour. Service advisors developed sensitive communication strategies for such customers, for understanding their life circumstances as a whole. This communication seemed to be critical for understanding what kind of help they actually needed. Furthermore, in these cases, the service advisors acted as a negotiator between the customers and the service providers.

In the wellbeing centers the service advisors’ first task was to build a good trusting relationship with the medical doctors and nurses of the surrounding centre. Other professionals then started to use service advisors as a resource for clarifying the needs of customers or assisting them with using digital applications, for example, applying for welfare support. In some cases, service advisors even reduced tensions between professionals.

Helping customers use digital interfaces seemed to play a minor role in proactive caretaker’s and sensitive service integrator’s roles, whereas face-to-face service with the most vulnerable citizens took most of their time, and their own digital skills lagged behind. However, in the contact point service advisors’ role, became like a digital guide and snag solver, encouraging customers to use digital portals. This may be due to more active and capable customers coming to the contact points or better ICT skills of the service advisor as well.

## 6. Conclusion and discussion

The empirical contribution of our paper was to make various directions of an emerging new profession called service advisor in between citizens and rapidly integrating and digitalizing service system visible and comprehensible by rich profile descriptions. We identified three types of service advising profiles, which develop in relation to different kinds of customer segments. They were 1) the proactive caretaker and co-creator, whose motivation is based on providing comprehensive support to customers in crisis, 2) the sensitive service integrator and interlocutor, who saves time from the other professionals in finding out the service needs of the disordered customers, and 3) the digital guide and snag solver, who uses fluently digital systems and also assists capable customers in their use. Our contribution was to show how the roles are influenced depending on which kinds of customers the employees serve.

According to Grant and Parker (2009) direct face-to-face relationships with the customers cultivate employees' prosocial motivation, making them persistent in helping them. They also noted that giving enough autonomy for the employees increases the likelihood that employees experience personal responsibility for their work. Keeping the future service advisor role flexible enough and providing enough autonomy to the employees to modify their roles seem to be important for the sake of their emerging organizational authorship and proactive behaviour. In uncertain environments the organization needs employees who become active agents, who notice the work "that is not yet done" and who are then willing themselves to start acting to fill in these gaps. The best motivators for the employee to take an initiative to expand his or her working role and then his or her knowledge and skills, may be in the relations and in the sense of autonomy. Service advisor's work in a complex system in which they have to sense citizens' needs, cross different service borders and handle the technological transition. They have to develop a sense of authorship of their own work in order to cope with these challenges day to day. This means gaining the ability to reflect on a person's actions, and to play an active role in the daily production and transformation of work processes (Gorli & al., 2015).

Three service advisor profiles represent kind of rich freeze-frames of the emerging new profession during the wider transition period in social and health care in Finland. Health care services and social services may have different understanding of the customer, and the ways he or she should be helped. In practice those differences become internal tensions between professionals educated by different professional fields. As our professional profiles and their backgrounds indicated the original education of the professional may have an influence on how the customers are faced and seen.

Although the digitalization of the social and health care is currently a hot topic and great hopes are layed on that it will bring new kind of efficiency to the services, the managers should also decide how they take care of those citizens, who may never be able to use digitalized systems. Understanding of how employee's motivation and authorship are enhanced by face-to-face contacts, may help design more meaningful service processes both for the employees and customers.

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## SERVICE DESIGN: AN APPROACH TO TUNING SERVICE PARAMETERS

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*The worldwide trend towards cost-effective quality product services has intensified the challenge among service providers, hence setting the level of competition exceedingly high in today's global service economy. Apart from pricing, service is an important business behaviour that plays a significant role in effecting customers buying decision. Service providers often strive to accommodate extensive services and to achieve an acceptable level of amenity for both enterprise and customer. The trade-off between the enterprise interest and the customer interest remains, however, this study aims to explore in more detail the conceptual design phase of service development in order to make available the optimal solution to balance the interest of both the service provider and consumer.*

### 1. Introduction

The activity of service development is considered a key challenge for many service oriented firms (Yahya; Crespi, 2010). In particular, the development of new services has become significantly competitive (Menor et. al., 2002), and has emerged as an important research topic in many service industries (Menor; Aleda, 2007). It has been observed that during the past few years, the field of service development has undergone remarkable growth and dynamism. In this environment, service providers are striving to ensure that their service offerings constantly conforms to the changing business needs in the most efficient and innovative manner. Furthermore, industrial services through a series of activities tends to bind customer value dimensions, so as to keep their offerings more customer oriented, comprehensive and tailored in nature (Priya; Rajkumar, 2011). However, to best cater for stakeholders interests, many service providers are facing issues that their current strategies and processes are not designed well enough to efficiently develop services (Imran et al., 2017). For example, for on-site operator training service, where there are minimal of two visits assigned per year on a flat rate basis, if any one of the two training sessions took longer than the planned time, then it would be difficult to charge the customer for extra hours since the number of hours per visit are not explicitly stated and there is no apparatus set to calculate the total hours of training. One way to balance such a situation is to have the person with the greatest expertise to cover the training session at a suitable time. Nevertheless, then the service provider should agree to bear the higher cost of retaining the well qualified staff, which in the end will influence the fi-

nancial target. Thus, while increasing company's service offerings, a higher cost may be incurred and eventually the expected return is not achieved (Neely, 2008).

In addition, the development process of the product services confront with the concerns that goes beyond their traditional offerings, by ensuring the connection between the customer's satisfaction level and other stakeholder's expectations (Cavaliere; Pezzotta, 2012). At the same time, service development process lacks the basic mechanism to finely adjust their services beforehand in a design phase as per the needs of stakeholders. Thus, this key question on how to design the service development process efficiently in order to achieve a good trade-off between customer satisfaction and company performance is not yet fully answered. This paper seeks to address this gap and investigates how these aspects can be covered in service design processes which could enable service providers to design their potential services in an optimal way.

The remainder of this paper is organised as follows: firstly, a novel approach is presented to systematically develop services by aligning relevant service characteristics in design specifications for engineering customer experience and business success factors. Next, information on the factors representing customer experience and their incorporation into service design is provided. Thereafter, the concept of the key success factors and their application on the design parameters is described. Finally, the paper concludes with a brief discussion.

## 2. The Approach

In this proposed approach, for the development of services the concept of service design parameters (Haeberle et al., 2016) has been regarded. The research then extends the service development framework introduced by (Imran et al., 2017), where four different service design models are proposed that ought to be taken into account in service development: the *governance model*, *product model*, *process model* and the *resource model*. The term *governance model* represents business-level requirements as agreed by all internal stakeholders, such as a set of organisation rules and policies, firm standards, guidelines and overall targets. The term *product model* maps what a service does. The *process model* specifies how the aspired service will be made available. The term *resource model* deals with the planning of resources, needed for the subsequent provision of services. Thereafter, based on the work by (Droll et. al., 2016), we establish a list of relevant customer experience factors.

This investigation introduces a way of tuning service design parameters that could allow service providers to optimise their service offerings. To achieve this goal, a systematic approach has been adopted, which put together the following aspects in service design phase:

1. Identification and incorporation of those service factors which reflect customer experience perspective;
2. Introduction of the measuring mechanism, and where the service parameters are classified based on the criteria of whether the parameters values are quantifiable or qualitative; and

3. Identification, categorisation and incorporation of monitoring factors, which observe precisely the numeric values reflecting the status of the service parameters involved in specific task(s) of a service.

This paper presents an approach to conform with the stakeholders' viewpoint and to be able to continuously enhance the service offering and elevate the customer level of satisfaction. This step-by-step systematic approach to service design, allows service provider to best adjust their service offerings and to advance their dynamic service portfolio that is adaptive to changing customer needs. In this extended approach, the service design parameters of both *process* and *resource models* (Imran et al., 2017) undergo further investigation, as illustrated after the dotted line in Figure 1. At this step, based on the domain for which the services are designed for, a list of customer experience factors is established, as described here (Droll et. al., 2016). This selected list of factors representing the customers' perspective is applied after a precise selection to the relevant parameters of service design categories.

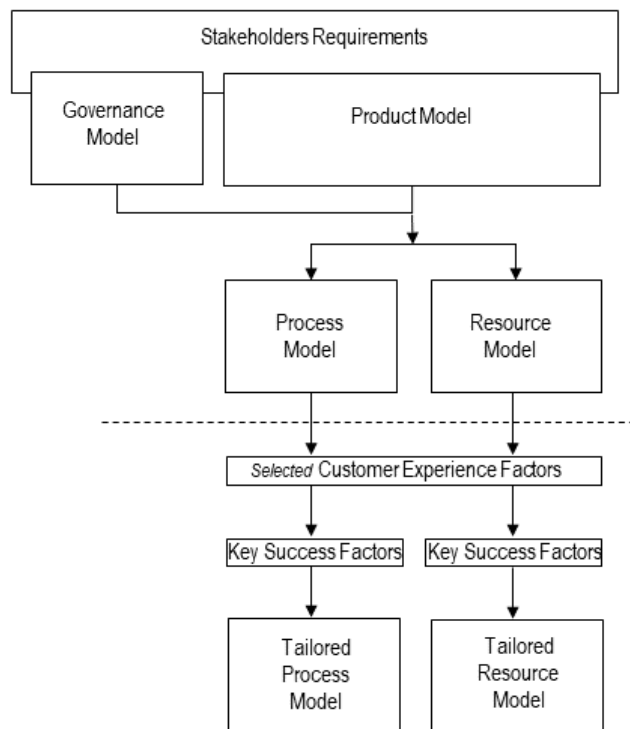


Figure 1: An approach to tuning service design parameters

Thereafter, the service design categories of *process* and *resource models* are further enriched with related customer experience factors. Before these service design categories are extended towards further adjustment, all of their service parameters go through an examination to make sure that their values are quantifiable and can be measured. Furthermore, the service design categories of each model are treated with a respective series of key success factors, to implement measurement arrangements. This would allow service designers to assess the performance of service categories belonging to each *process* and *resource model*, and to verify that these designated design categories reflects the objective of service parameters set earlier in the *governance* and *product models*, thereby, proposing an innovative approach for tuning service parameters.



## 2.1. Customer Experience Factors

The application of customer experience, to represent how the customer perceive the offered services has always remained in demand and plays a significant role in determining the success of a company's offering. These factors aim to express the imminent response of a customer to its encounter with the company' services and their perceptions, intentions, and behaviours that is developed through the service lifecycle (Yang, 2007). Therefore, ensuring the application of customer experience factors in a service development phase along with the service design parameters would together constitute the right environment for engineering customer experience. For this purpose, based on the foundation work to possibly distinguish coherent customer experience factors in service design in (Droll et. al., 2016), twelve customer experience dimensions are identified as shown Figure 2.

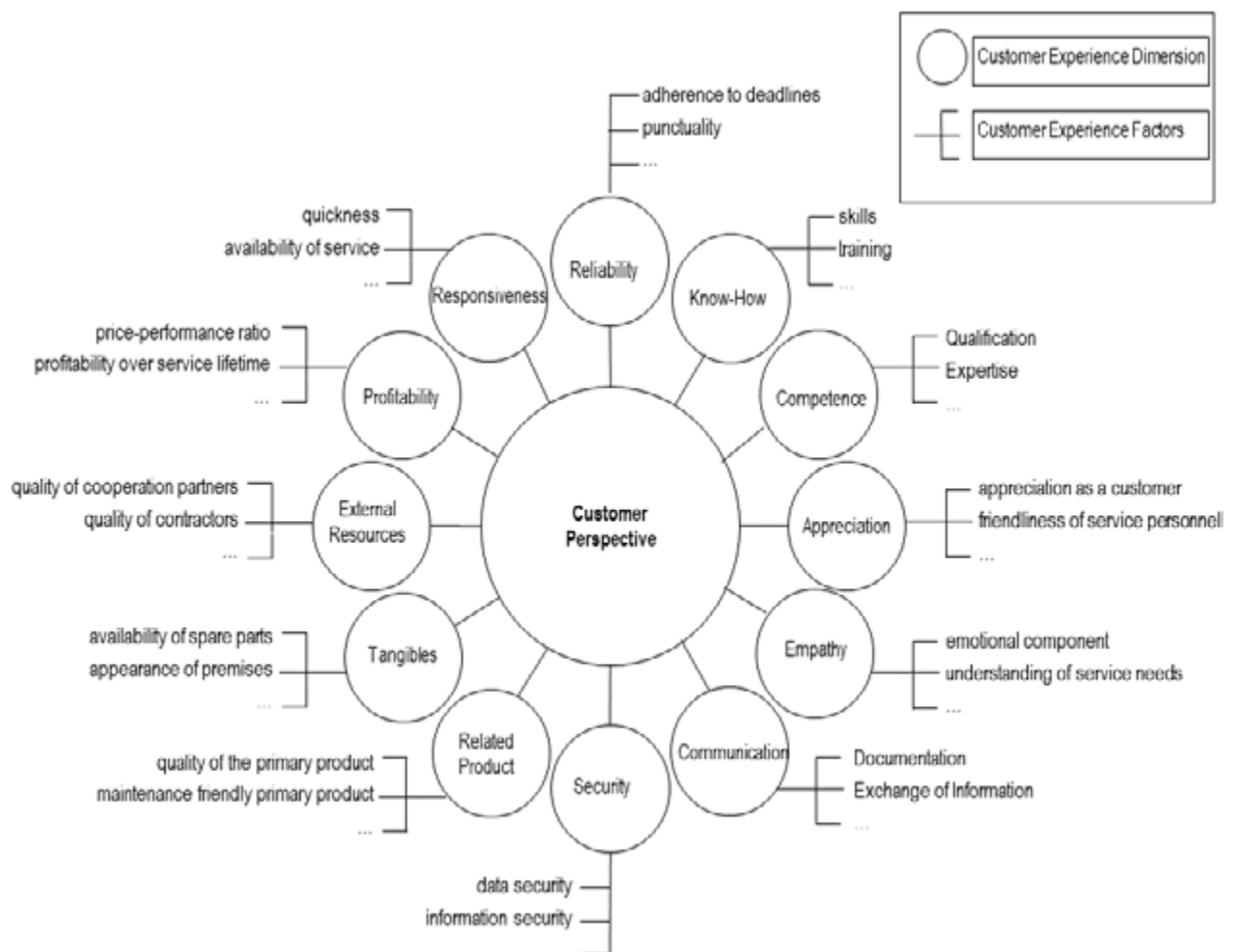


Figure 2: The customer experience dimensions and their factors

A survey of the specific domain is recommended to be performed, where domain experts belonging to the relevant service industry are required to participate, and follow a step-by-step guideline as follows:

1. The participants are questioned on their views, and to identify if any dimension important to their customers was omitted.

2. The participants are asked to grade each of the twelve customer experience dimension based on the Likert-scale of five (1 denotes “not important”, and 5 “very important”).
3. The higher graded customer experience dimensions are further sorted according to their significance, where the most important on the top and the least. This would ensure service designer to focus attention on the most prominent experience dimensions.
4. For each of the selected dimensions, a list of customer experience factors needs to be established.
5. After the survey, the set of these organised customer experience factors can either be applied directly on the service design categories of the *product* and *resource model* or can be further refined with customer survey before being applied to design categories. These factors are applied to the relevant service design categories that are selected based on the domain expert judgement. Thus, to operationalise the factors representing customer perspective, we make sure there is a service parameter that reflects the customer experience.

For better understanding, an example is given here to explain how the above stated guideline steps can be applied in a real situation at an on-site operator training service. The survey is carried out where domain experts from the field of on-site operator training participated. As a result of the first step, the respondent does not suggest any additional dimension, on the question of other than existing twelve experience dimensions, whether any further experience dimension is required. In next step, as a result of a Likert scale survey (see table 1), the list of most important dimensions are then sorted based on their significance, where the most important is on the top, as tabulated in table 2. To proceed further, from the sorted list of significant experience dimensions only the top four services dimensions are selected, and for each dimension a list of customer experience factors is established as show in table 3.

**Table 1: Grading of the customer experience dimensions on Likert-scale**

	<b>Customer Experience Dimension</b>	<b>Likert scale grading 1 – Not Important 5 – Very Important</b>
1	Reliability	2
2	Know-How	5
3	Competence	5
4	Appreciation	3
5	Empathy	2
6	Communication	4
7	Security	1

**Table 2: The list of customer experience dimensions sorted by significance**

	<b>Sorted by significance</b>
1	Know-How
2	Competence
3	Communication
4	Profitability
5	Appreciation
6	Tangibles
7	Reliability

8	Related Product	1	8	Empathy
9	Tangibles	3	9	Responsiveness
10	External Resources	1	10	Related Product
11	Profitability	4	11	Security
12	Responsiveness	2	12	External Resources

**Table 3: A short list of customer experience factors for each dimension**

Experience Dimensions		Customer Experience Factors
1	Know-How - refers to the satisfaction with the knowledge and the transfer of this knowledge from the service provider, such as in the form of training, consulting and coaching support with expert advice	Training Coaching support Advice and guidance Intercultural
2	Competence - refers to the extent that the service providers has competence in meeting the industrial challenges to stay up to date and be capable of advancing, which will allow them to handle upcoming problems and challenges in an expert manner	Qualification Expertise Experience
3	Communication - the overall exchange of information on the offered service lifecycle between service provider and the customer	Documentation Exchange of Information
4	Profitability - concern with cost effectiveness of the service offered, that is, an adequate return on the customer's investment during the service lifecycle	Price-performance ratio Profitability over service lifetime

The list of customer experience factors is then applied directly to the service design categories of *process* and *resource models*. An example as shown in Figure 3, where for the *process model* of the on-site operator training service, the factors representing customers concern with regards to *price-performance ratio* is expressed by applying design parameters, firstly under the sub category *transaction* of the service category *timing* and secondly under the service category *process design*. Furthermore, the customer experience factor *profitability over service lifetime* is put into effect through service parameters *letter of participation* and *certification* under the sub-category *testing and evaluation* of the category *process design*.

In the same manner, for the *resource model* of the on-site operator training service, for the customer experience factor *training* under the dimension *know-how*, the position of *trainer* in the *area of training* is selected. To reflect customer perspective on their *competence*, the trainer should have an expertise on *machine operation* and *machine maintenance*. Likewise, the customer experience *communication* is applied in both *process* and *resource models*. The assigned parameters under the *process model's* category *process design* as *lectures*, *workshops* and *machine training*, and in *resource model* under the category *utilities and materials*.

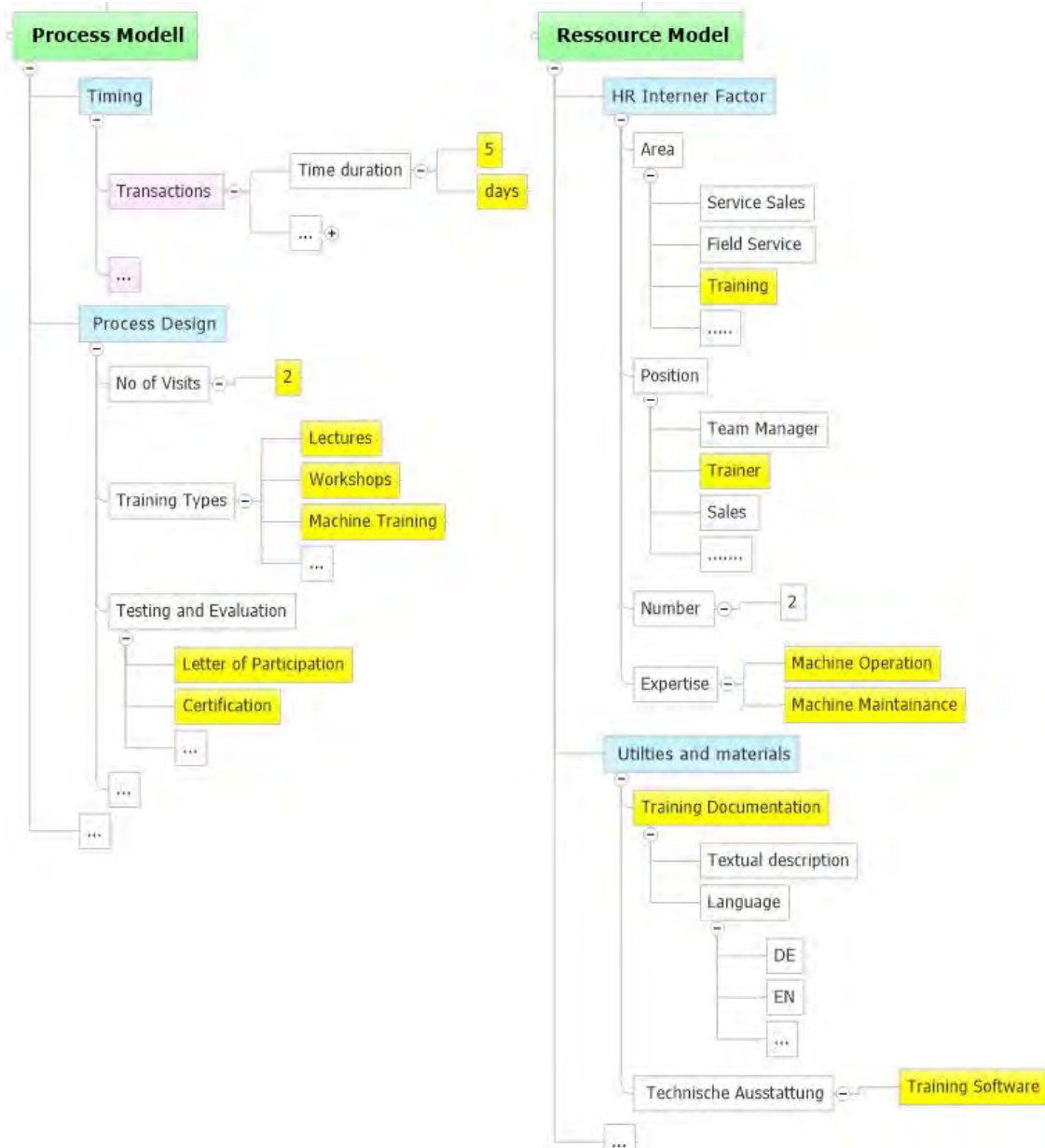


Figure 3: Application of the customer experience factors in product and process models

## 2.2. Key Success Factors

The key success factors aim to address main business requirements, for which the appropriate service design parameter(s) should comply with, as given in the *governance* and *product model*. For this, the relevant service parameters of *process* and *resource model* are taken into account to assure that they reflect the interest of stakeholders. Therefore, to assess the performance of these specific service design parameters by measuring their values through key success factors. A table with a recommended list of key success factors for each process and *resource model* is established, where 45 identified key success factors can be applied with service pa-

rameters of *product model* and 32 identified key success factors for the *resource model*, a section of each is given in Table 4 and Table 5 respectively. These provide the description on each key success factor and the formula on how to apply it. For the application of the key success factors on a service design parameters, requires to take following proposed two steps:

- 1) The significant service design parameter which have high impact to fulfil the stakeholders' requirement, and this requirement is of greater importance, is selected from either *process* or *resource models*. It is important to make sure that the values of all service design parameters are quantifiable.
- 2) For each of these preferred service design parameter, we then select an appropriate key success factor. The application of the key success factors on the relevant service design parameters, depends heavily on the expertise of domain experts.

**Table 4: Few of the established key success factors for process design model**

Key Success Factor	Description	Formula
1 Offer success rate	An indicator of the relationship actually acquired to offered contracts.	Offer success rate = number of total acquired orders / number of offered ordered.
2 Ordering channel quote	The ordering channel quote is the relation between the orders of a distribution channel, such as channel A , to the total number of orders received from all the channels, such as A, B, etc.	Ordering channel quote [in%] = order sales from a channel / total number of orders x 100
3 Visit efficiency	The visit efficiency is an indicator of success in acquiring orders from all types of customer contact, this also includes telephone or written contact.	Visit Efficiency = acquired orders / number of customer visits
4 Efficiency	The efficiency generally describes the ratio of benefits to costs and thus represents an important indicator of the monitoring of efficiency.	Efficiency = income / expenses
5 Error rate	The margin of error is the faulty service with the total number of services in relationship.	Margin of error = number of failed service or not successfully completed services / total number of conducted services
6 Time delivery	Deliveries are called on time, that is, they are delivered within the promised deadline. A related term is the delivery reliability.	Number of the on time deliveries / total number of shipments
7 Availability	The availability can be based on the time in which a system is available, define.	Availability = total available time - total downtime / total time

**Table 5: Few established key success factors for resource design model**

	Key Success Factor	Description	Formula
1	Capacity utilization	Expresses the ratio of the actual output to the capacity.	Utilization rate = output / capacity, for example, utilization rate [%] = average capacity usage [h] x 100 / total capacity [h]
2	complaint rate	Shows the share of complained products in the number of all orders (per year).	Complaint rate = number of faulty goods receipt items per year / Number of incoming positions per year.
3	Maturity of Workforce	The maturity of the workforce (human resources), that is, the number of skilled employees compared with the proportion of new employees.	Maturity of Workforce = number of experienced employees / total number of employees
4	Resource efficiency	The measure of resource used by the firm and of the available resources.	Resource efficiency = actual amount of resources used / quantity of available resources
5	Training quota	The proportion of employees who annually complete an education or training.	Training Quote [in%] = number of employees, training or further education complete / number of employees x 100
6	Overtime rate	Overtime working hours that go beyond the regular planned working hours.	Overtime rate = [in%] actual work - planned working / planned working x 100
7	Availability rate of resources	The availability of resources on the required period of time.	Availability rate [in%] = actual availability during the period / required availability in the period x 100

For better understanding, on the use of key success factors for refining service parameters, an example on on-site operator training service is further elaborated. The two steps in the application of key success factors on service design are as follows. As a result of applying the first step, we select service design parameter *time duration* and the number of *visits* from the *process model* (see Figure 3), as the ones which could have greater influence on the fulfilment of the requirement to maximise trainer availability. To achieve this, we select from the list of key success factors, an availability factor, as to measure the number of days where the trainer will actually be available to conduct training. That is, from the service parameters *time duration* and *no of visits*, we conclude that the trainer will conduct training in total of 10 days, out of 22 working days as indicated by another parameter *working hours* of the *resource model*, thus resulting with the 45% availability.

Likewise, the set of key success factors identified for the *resource model*, are applied with the relevant service parameters. For example, for the requirement to have qualified training personals, we select key success factor *maturity of work force* to be applied on the service parameters *number*. Thus, if both trainers come from the training area with the expertise to operate and maintain machines, then this would result in 100% maturity of workforce.

As a result of applying this approach, the succeeding tailored service design parameters tends linked with customer experience factors and treated with key success factors tailored intends to improve service deliverance and quality.

### 3. Discussion and Conclusion

The research described in this paper attempts to explore the way in which conceptual design phase of service development can accommodate enterprise and customer perspectives. For this purpose, the proposed novel approach demonstrates the ability to considerably enhance the service design, by associating supplementary parameters with it. These parameters can provide service providers with the capability to engineer customer experience and to assess how precisely the service design is defined. To correspond with customer expectation, the selection of customer experience factors requires continuous monitoring as to what constitutes customer experience and how it may change over time. It is expected that this attempt would contribute to identifying and associating those variables that could have a positive influence on customer expectations. Furthermore, to apply this innovative concept where service provider can assess the ability of service design attributes to meet stakeholders' objectives, the concept of key success factors is introduced. The established list of key success factor is not exhaustive, however, it serves the purpose to demonstrate their use by comparing the measuring values of the service design parameters. The research stands on the concept that what can be measured can only be tuned. Hence, it should also be mentioned here that it was a challenge to quantify the service parameters for measuring purpose, as they may subject to individual perception. Therefore, the resultant numeric value may vary based on target audience and time. The decision on the selection of service design parameters that could have high impact in fulfilling the requirement of greater importance, relies on the domain expert opinion. Moreover, the selection of which key success factors to be applied on the relevant service design, also depends on the strategy applied by the service provider. Thus, this research aims to fine tune service parameters to best represent the underlying requirement by incorporating relevant service characteristics in design specifications. Understanding this tuning mechanism can pave a path to develop a more cost effective higher quality services with improved customer satisfaction.

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## SERVICE INNOVATION FOR BUSINESS COMPETITIVENESS AND ITS LINKAGES WITH OPEN AND SOCIAL INNOVATION: ANALYTICAL FRAMEWORK AND IMPLICATIONS FOR POLICY AND METRICS

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**Abstract:** *The objective of the paper is to explore why service innovation is becoming more open and more social. Building on some examples, it discusses the linkages between service innovation, open innovation, and social innovation and proposes a model rooted in previous multiagent frameworks for innovation in services upon which the multirole dimension become a new interpretative category. Implications suggest that policy intervention for business competitiveness seems necessary in different arenas, and the availability of better metrics is a must.*

**Key words:** *services, service innovation, open innovation, social innovation*

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## 1. Introduction: services going open and social

Pioneering forms of innovation are arising in parallel with the plethora of economic, societal, and technological changes stirring our increasingly connected world. In the past, innovation served industrialization. Today, citizens' needs, well-being, and quality of life are the focus of most innovations. Thus, innovation increasingly targets major social needs and challenges, such as ageing populations, social exclusion, health and education, promotion of well-being, and climate change. Innovation dynamics are much more open than in the past. Users take leading roles, and diverse organizations engage fully. They transcend the traditional (techno-economic) understanding of innovation and new practices—such as personal fabrication, open innovation, user innovation, design innovation, community innovation, and crowdsourcing—have gained momentum. In parallel, new modes of innovation within more complex innovation systems are replacing or complementing traditional linear innovation processes. Three major new forms of innovation have emerged recently:

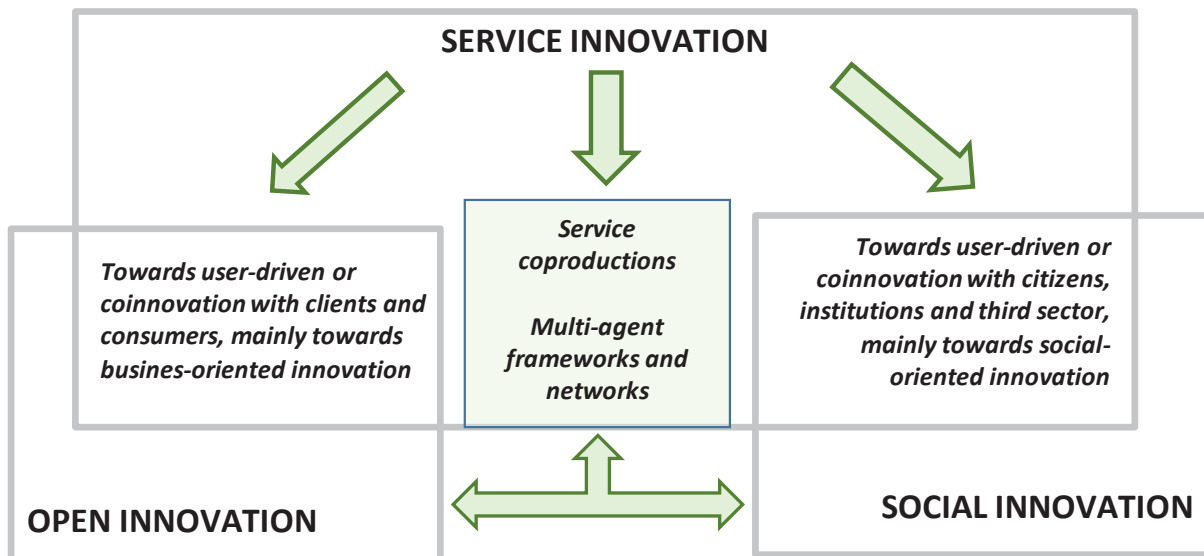
Service innovation, the necessary complement to the most traditional technological goods innovations. It enables creating new intangibles, and combinations of tangibles and intangibles, to increase growth and improve welfare in society. Increasing societal needs and challenges need new and improved services.

Open innovation, a business model that helps transfer knowledge and technology across organizational boundaries. Innovation results from applying both internal and external ideas and resources. Open innovation highlights the cooperative and collective nature of innovation.

Social innovation, a new way of generating innovation processes oriented to social goals, implying the involvement of social actors. In social innovation, different roles and new modes of interaction broaden innovation solely from the economic domain to also include social and public domains (OECD, 2009).

Figure 1 below illustrates the interrelated nature of these three major forms of innovation: service innovation, open innovation, and social innovation. The three phenomena are different lenses on innovation that together give a holistic view. When we assess any one of the three deeply, we arrive at the other two. For example, innovating in ways that deliver better services and social welfare coincides with the growing demand of citizens to be fully involved in finding collective solutions to social issues (i.e., service & social innovation becomes open). The concepts of co-creation, co-production, and user-driven innovation are the foundations of a shared conceptual framework, as highlighted by the figure. The approach is also multi-agent—it considers the role of voluntary groups, third sector and social organizations, public sector institutions, and private sector businesses to consider innovation in user-led market and non-market goods and services. The multi-agent framework is useful to define innovative service co-productions because it involves the potential to understand the engagement of society, and the ample constellation of relationships created around the set of agents involved in different kind of co-production and co-innovation processes.

Figure 1. Bridging services, social and open innovation



Source: Authors' elaboration

Examples of how services innovation is becoming more open and more social abound. It is possible to classify them into three different categories showing that service innovation has become (1) more open, (2) more social, and (3) both more open and more social. The literature has offered many examples of open innovation in services. For example, Chesbrough (2011) compares Lego to Amazon. Lego is following an “outside-in” strategy, welcoming new external contributions for design and eventually leading a new service industry related to teaching robotics using Legos. Amazon also followed an inside-out strategy, welcoming revenues from external use of a company’s knowledge through helping retailers to have their own Internet retailing, and offering customers the use of cloud computing. Another example of open innovation in services is the creation of living labs by telecommunication companies for physical places where client engagement is produced to design new service experiences. Another is the transport apps where collective co-creation is needed—Waze, Uber, Car2Go, and so on. Another is the use of big data in innovation strategies by sectors such as banking, retail, transportation, and health.

Services do not become social innovations equally quickly in every sector and area. However, such transformations are common in areas related to social services, services related to smart cities, tourism in rural areas, energy efficiency, and transport and logistics. Many public-private-third sector innovation services in Europe are social innovations (Gallouj; Rubalcaba; Windrum, 2013). In the developing world, M-PESA is a paradigmatic example (Mbiti; Weil, 2011). It started as a mobile-money system run by Safaricom, Kenya’s largest cellular network. It became a world-leading general money-transfer scheme, useful in countries where many workers in cities send money back home to their families living in rural villages.

**Box 1. The MOOCs case of social and open service innovation**

MOOCs are a recent innovation<sup>1</sup> that have attracted lots of attention in the last five years (Daniel, 2012). The emergence of MOOCs has opened strategic discussions about their disruptive innovative character (Yuan; Powell, 2013). For some scholars, MOOCs herald a change in the educational landscape that poses a real threat to the traditional model of providing degree courses. Beyond this consideration, MOOCs are bold, open, and social innovations. MOOCs originated in the open educational movement, embodied in the development and adoption of open educational resources. However, what makes them embrace the concept of open innovation fully is the way that different actors engage in the learning experience, thus influencing the learning outcome. MOOCs have broken the linear learning scheme of the past (Torres; Gago, 2014), where learning was a unidirectional process of knowledge transmission. MOOCs promote a different experience, where learners are members of a community and the educational outcome is the result of innumerable interactions with other members of the community (not only learners but also, amongst others, tutors and curators), who engage in multiple co-creation processes channelled by virtual platforms. Participants regard the interactive character of learning as highly valuable (Khalil; Ebner, 2013). As a paradigmatic case of social innovation, MOOCs are offered free of charge, to any number of people, anywhere and anytime. They enable disadvantaged students who could not otherwise afford a formal education to access higher education and beyond. Thus, MOOCs contribute to the democratisation of education (Patru; Balaji, 2016). Second, they can reduce skills and aptitudes mismatching the needs of industry in many countries. This disconnect is contributing to huge unemployment amongst youths and adults, particularly amongst vulnerable groups. MOOCs can be useful in giving job-oriented training and skills development, and policies and initiatives in developing countries are emerging to strategically use online learning, including MOOCs, for workforce development and skill building programmes.

There are also examples of service innovation that are both open and social. In rural areas, transforming farms into tourism destinations involves open and wide efforts to have local communities lead the change with the co-innovation support of many agents in the innovation system. Another good example of how services innovation has become more open and more social at the same time is Massive Open Online Courses (MOOCs) in the educational sector (see box 1, above).

<sup>1</sup> Although some early experiments were undertaken as early as 2006, Stanford professors S. Thrun and P. Norvig delivered the first major MOOC in 2011, an artificial intelligence course at Stanford that drew 160,000 online registrants.

## 2. Bridging services and open innovation

Innovation is rapidly changing and being increasingly distributed. In today's complex world, a single organization faces increasing difficulties conducting innovation in isolation. The centralised, inward-looking approach to innovation has become inefficient. Thus, the use of collaborative and open approaches to innovation has increased, based upon the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation (Chesbrough, 2006). Other factors have supported this trend towards increasing openness in innovation. They include the institutionalisation of the information society, the rise in the mobility of qualified workers across firms' boundaries, a decrease in the productivity of innovation, and the growth in the number of technological options and opportunities. Openness entails that both internal and external actors can share information and knowledge. Equally importantly, it requires that valuable ideas can leave the innovation process at any stage. Despite the ambiguity of the term, openness mainly means forming alliances and partnerships with private organizations and with the scientific and technological system. The benefits come from sharing knowledge and spillovers, licensing intellectual property, launching spin-off companies, and developing fusions and acquisitions.

Innovation scholars have long highlighted the collective nature of innovation. Accordingly, the open innovation model resonates with several strands of previous research. One is research on systems of innovation (because firms rarely innovate in isolation from the economic system). Another is work on strategic cooperation (where private and public organizations seek to generate synergies and cross-fertilization effects by pooling their complementary assets). A third is the study of absorptive capacity (because firms are critically reliant on recognizing, adopting, and exploiting external knowledge). A fourth is on user-developed innovations (by recognizing users as vital contributors to innovations in many different sectors). Open innovation emphasizes how earlier related concepts from the service innovation discipline reflect central aspects of the model, as in the case of the multi-agent framework, which enables an explicit consideration of the characteristics of economic agents and their interaction in the co-creation and diffusion of service innovations. From this perspective, service innovation is an interactive process in which multiple actors play a role.

Open innovation is relevant for service firms. However, because of the traditional association between in-house R&D development and innovation performance, the first discussion around the open innovation model focused more on product and technology innovation than on service innovation (Chesbrough, 2011). Most research works were for large technology-based companies, where the notion started, leaving service innovation overlooked in the literature related to open innovation. Service innovation scholars emphasised this product-technological-myopia. A few firms account for most R&D expenditures in technology. Most of them have formal and distinct R&D departments, an organizational arrangement that is uncommon in the service sector (Salter; Tether, 2006). The standard R&D-related measures were simplistic and under-reported the innovation activities of many small firms and service providers, which rarely engaged in formal R&D processes. Given the low intensity of R&D in

most services companies (Rubalcaba; Gallego; Gago, 2010), the open innovation model also emerged as a more credible response to innovation in services (i.e., business services), because it allowed for greater use of external sources as innovation inputs.

The open innovation 2.0 framework (OI20 onwards) emerged about a decade after Chesbrough's (2003) conceptualization of open innovation. OI20 suggests innovation depends on extensive networking and co-creative collaboration between all actors in society (civil, academic, business, and government). Together, they drive structural changes (Curley; Salmelin, 2013), around cultivated innovation ecosystems in search of shared value and enabled by the collision of three megatrends: digitization, mass collaboration, and sustainability. Although broadening innovation networks finds more innovative solutions, wide-ranging networking may not always be desirable. From dealing with increased external contacts, firms face organizational and cultural issues. Understanding service networks (i.e., interdependencies between the multiplicity of actors and stakeholders, the distribution of task or services) adds a level of complexity to the phenomenon. Therefore, networking behaviour, instead of extensive networking, may be the key to success. Over-search—spending too much time looking for external sources of information and knowledge—may lead to inferior innovation. Broad and deep search for sources of information and knowledge may be curvilinearly related to innovation performance. While openness may have a positive effect initially, firms can over-search or come to rely too heavily on external sources.

Moreover, within this OI20 model, citizens and users (adopters of the innovation) take prominent roles as active and integral participants and contributors along the whole of the innovation process in the co-creation of solutions that meet their needs. This prominence of citizens and users again links the OI20 model with the service innovation discipline. The latter has traditionally considered users (customers) one of the basic, inherent, and most common partnerships for service innovation. Service innovations often arise from the close collaboration between the service provider and its customers, as person-to-person interaction is constitutive of the service provision itself. Service innovation is user-driven and directed towards a specific user experience (European Commission, 2011a).

As service complexity rises, the user becomes a co-producer of a service innovation. The interaction needed in service co-production leads citizens and users to no longer serve as mere suppliers of information. Instead, they become key contributors of innovation. Effective service innovation, hence, requires citizens and users to be fundamental parts of innovation ecosystems, which allow sharing creativity beyond organizational boundaries and applying it through innovative co-creation. Creating such innovation ecosystems would lead organizations to adopt novel structures and develop new abilities designed to face emerging issues (i.e., the trade-off between personalized services and asset-based services, the networking governance, or the exploitation of the present and future ICT environment in the provision of public e-services).

### 3. Bridging service and social innovation

Some definitions of social innovation pinpoint services just as one outcome amongst others (including products, models, and processes). For example, this is the case of the TEPSIE project (2013), for which social innovations are both good for society and enhance society's capacity to act, and present some peculiar features (e.g., novelty, implementation rather than the mere development of new ideas, meeting social needs, effectiveness, and empowerment).

Nevertheless, the service-dominant logic, which highlights the service function incorporated in every product (Vargo; Lusch, 2004, 2008), opens the door to regarding services as a dimension of the nature and outcome of any social innovation. Some international policy organizations have defined social innovation in similar ways. The OECD LEED Forum on Social Innovations (2000)— in the same vein as the European Commission (2011b)— stated that “Social innovators identify and deliver new services that improve the quality of life of individuals and communities, using innovative processes aiming for instance at new labour market integration, social inclusion, finding new ways to address health care, education delivery, resource efficiency and environmental challenges”. For the OECD, social innovation “seeks new answers to social problems by: identifying and delivering new services that improve the quality of life of individuals and communities; identifying and implementing new labour market integration processes, new competencies, new jobs, and new forms of participation, as diverse elements that each contribute to improving the position of individuals in the workforce.” Both definitions consider services the outcomes of social innovations. This is surprising because definitions of social innovation usually exclude services (or consider services just a part of social innovation). However, it is justified because new services target improving the quality of life amongst individuals and communities. In fact, many social innovations take place in services. Services sectors implement most social innovations. Examples include health (e.g., preventive treatment), education (e.g., new pedagogic techniques), financial services (e.g., microfinance, mobile banking, financial inclusion, crypto-currencies). ICT services (services based on social networks), tourism (e.g., rural tourism initiatives), social services (e.g., innovations for inclusion), and environmental services (e.g., smart cities) are further examples.

Furthermore, the linkages between services innovation and social innovation transcend outcomes. Other elements include the inputs to social innovation and the participatory process of social innovation in service co-productions.

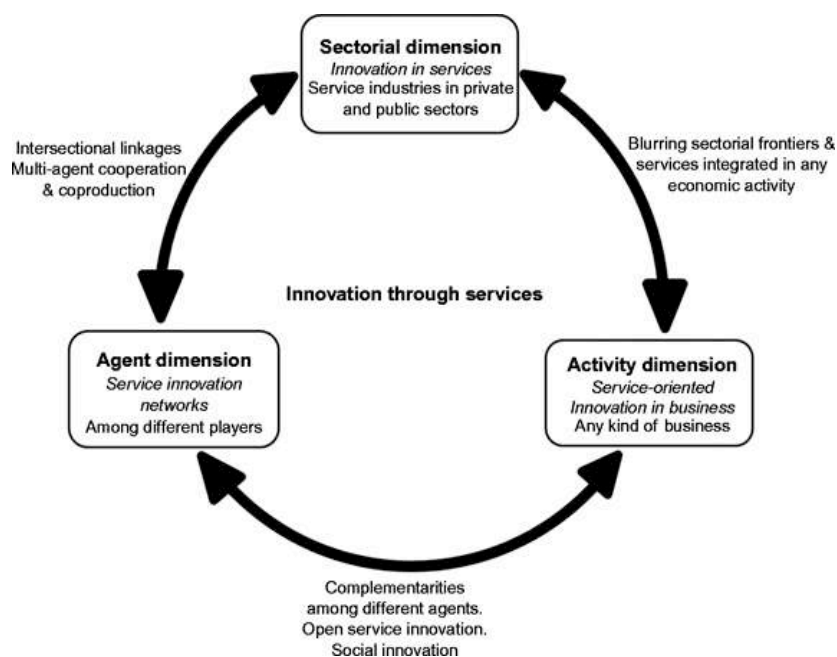
Regarding services as inputs to social innovation, service innovation is a dimension behind any social innovation process. Knowledge-intensive services (KIS) are case in point. As sources of service innovation, they ultimately ease both the creation and the implementation of social innovations, be they in the private sector, public sector, third sector, or amongst citizens and organizations in general.

Finally, regarding service co-production, the participatory nature of service innovation is conducive to social innovation. The participatory processes characterizing social innovation need a certain level of service co-production by users. The following section examines the role of co-production in bridging the concepts of social and service innovation with open innovation by exploring a multi-agent model.

## 4. Service innovation in multi-agent frameworks

Co-production is also fundamental when explaining social innovation as a case of service innovation and facilitates introducing the concept of open innovation. Following the three-dimensional framework that Rubalcaba *et al.* (2012) proposed, figure 2 illustrates this framework. It consists of innovation in service sectors (i.e., the traditional literature on innovation in specific services), service innovation (i.e., most of the management and marketing approaches to service innovation) in any business, and services as multi-agent co-productions. This latter approach emerges from the multi-agent perspective on service innovation (Gallouj 2002; Windrum; Garcia Goñi, 2008). The multi-agent perspective conceptualizes social innovation in terms of interlinked agents and activities. The activity dimension in the multi-agent framework stresses the non-technological aspects of innovation (Gallouj, 2002, Gallouj; Djellal, 2013) leading to the inclusion of social issues and social actors in the development of new services.

Figure 2. Three dimensions of innovation through services



Source: Rubalcaba *et al.* (2012) Reproduced by permission of the *Journal of Service Management*.

Once a new solution (social innovation) emerges in the form of services within the socio-economic system (Rubalcaba, 2016), civil society is embedded in the innovation process, and users play prominent roles (Harrison *et al.*, 2010). Here again, citizens become active actors and innovators, not passive consumers of new services. The concept of co-innovation stresses the importance of customer-producer interactions in innovation activities. Typically, citizens and organizations take part in developing innovations without a clear profit motive but for the benefit of civil society. They



serve as mediators to achieve a result or transfer information to improve existing services or organizational forms. Finally, citizens—and their well-being and quality of life—become the objects of their own innovation developments. As service innovations increasingly aim at addressing societal issues, innovation becomes entirely user-centred. The improvement of future standards of living is the outcome of service innovations, and citizens and organizations are the final beneficiaries.

The activities and actors involved show not only the multifaceted nature of social innovations but also the specificities of these innovations. Their interactions are much more than a traditional service relationship. The sources and goals of innovation are more diverse, and actors take part for varied reasons, some of them voluntary. Social innovations may (1) appear amongst individual citizens who respond to pressing social problems, (2) be produced by private, public and third sector organizations separately or in cooperation, or (3) result in fundamental societal or policy changes. Research in these three areas has led to these three topics: the empowerment of citizens and stakeholders; public-private partnerships (PPPs) and the so-called “social economy;” and the governance and management of social and system innovations. The social economy consists of non-profit organizations, cooperatives and associations, social entrepreneurs, and partnerships between the public and third sectors. The third sector may produce social innovations autonomously, with state support, or in partnership with the state. In such partnerships, the third sector actors may play roles ranging from sub-contractors to common design and implementation of social policies with the public stakeholders (Harrison *et al.* 2010). The private sector can also take part in social innovation processes (Gallouj; Rubalcaba; Windrum, 2013).

In this services innovation framework, open and social innovations are mutually reinforcing. This social innovation occurs as a service and can take place in the government sphere (in areas such as healthcare or schools), in the business sector, or in the third (non-profit) sector. As the subject of action, citizens play a fundamental role as producers of social innovation, social innovators, or social entrepreneurs, working at the crossroads of market, state, and civil society and often receiving backing from the public sector and third sector. To respond to an unsolved societal issue, social entrepreneurs and social agents aim to find and deliver new solutions within the system the well-being and quality of life of individuals and communities. While meeting social needs and tackling societal challenges, social innovations empower people and create new social relationships and models of collaboration. Cross-sectoral collaborative approaches favouring cooperation between the public, private and third sectors facilitate the emergence of effective responses to social needs and challenges.

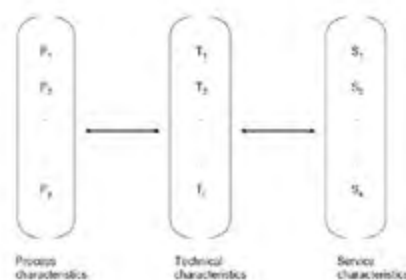
## 5. A complementary Lancasterian model for social innovation in services

Based on previous elements in the multi-agent frameworks, a multi-agent model can be proposed. The roots of this model can be found in the innovation model developed by Saviotti y Metcalfe (1984) and later adapted to the needs of services by Gallouj (1994, 2002), and Gallouj and Weinstein (1997). This conceptual framework is based on the representation of the product or service as a system composed by characteristics, technical or service characteristics on the one hand, and capabilities on the other hand. Service innovation is produced when there is a change in the service characteristics.

The characteristics approach is based on the theories developed by Lancaster (1966, 1971). He observed how products can be described in a range of characteristics. Any product could be described as a compilation of "service features" or attributes embodied in the good / service. In the Lancasterian approach, consumers do not want a product itself, but the compilation particular characteristics of services offered. These, along with price, are the basis of consumer choice. A car is a compilation of service characteristics like mobility, security, speed, efficiency in fuel consumption, etc.

Saviotti and Metcalfe (1984) took the approach of Lancaster and applied it to the study of innovation in manufacturing. Firms compete by offering unique combinations of features that create services more attractive to consumers than those offered by competitors. In fact, they offer consumers different points within the multi-dimensional space of the service features. Innovation is the means through which companies seek this multi-dimensional space of features. The Metcalfe-Saviotti model defines a system of "technical features" that produce "service features" desired by consumers. Among the characteristics of the process, Saviotti (1996) includes tangible assets (such as plant and equipment), intangible assets (such as brand, copyrights and patents), human resources (such as education, training, experience, and skills staff) and organizational resources (such as corporate culture, organizational structure, rules and procedures of the company) extending from the design, production and marketing. Figure 3 shows the basic diagram describing the model.

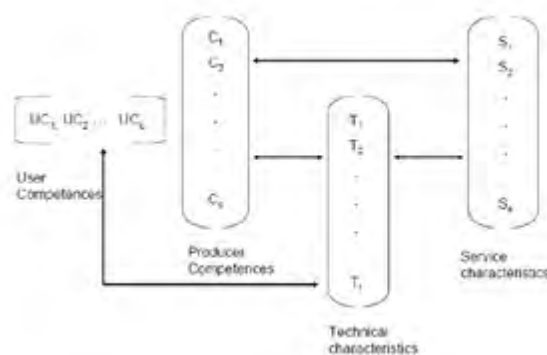
Figure 3. Characteristics in the Saviotti-Metcalfe model for innovation



Source: Saviotti and Metcalfe, 1984

According to Gallouj (2002), a delivery service can thus be defined as the simultaneous mobilization of technical characteristics (tangible and intangible) and skills (internal and external) to produce the characteristics of services. Innovation can be defined as any change that affects one or more terms of one or more feature vectors (technical service) capabilities or "skills". These changes cover different basic mechanisms: evolution or change, disappearance, appearance, association, dissociation, "formatting". The Saviotti-Metcalfe model was adapted by Gallouj and Weinstein (1997) and Gallouj (2002) to the particular case of services and service innovation. Services characteristics can be represented by vectors like in figure 4.

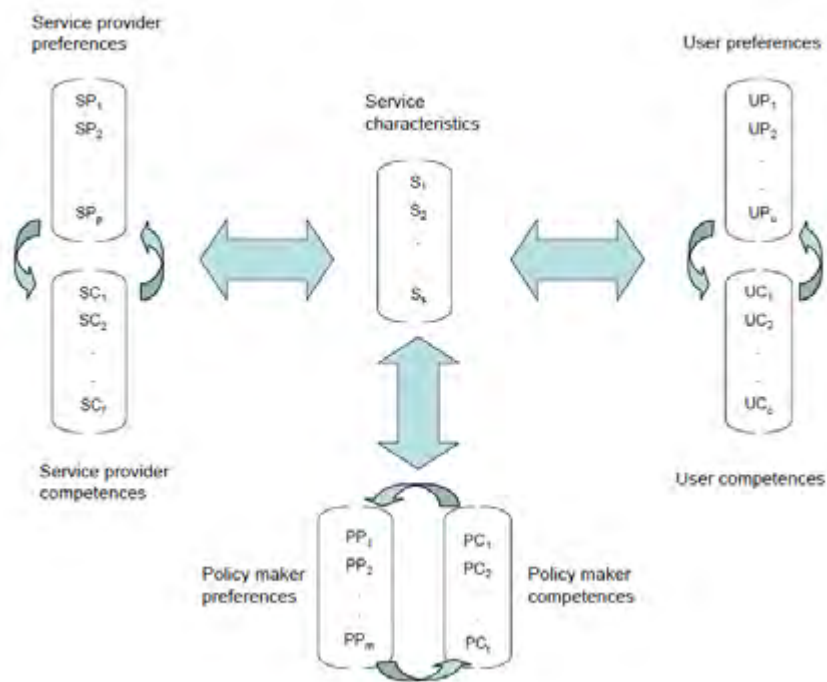
Figure 4. Service capabilities in the Gallouj and Weinstein model (1997)



Source: Gallouj and Weinstein, 1997

The Gallouj and Weinstein (1997) differs notably from Metcalfe-Saviotti model in several aspects. The most visible one is the replacement of the "characteristics of the process" by "productive competences". At first glance, this appears to be a narrower definition of the assets of the companies producing the model Saviotti-Metcalfe. However, a deeper analysis shows that the productive capabilities include tangible assets, intangible assets, human resources and organizational resources. Another difference is the possibility to include new dimensions such as the inclusion of a supply chain or several agents that interact in innovation. This also open a door to the study of multiple public and private actors, all who bring specific knowledge and skills. This lead to the adaptation of the model proposed by Windrum and García Goñi (2008). They adapt the Gallouj previous models to understand innovation in the health sector. Their model is different with respect to previous ones in two main senses: on the one hand, in integrating the policy makers in the model, and on the other hand, it incorporates preferences and capabilities, as the two separate elements of the competences offered by the agents, thus underlining that specific weights of particular goals may be very different, especially in public services such as health and education. (Figure 5).

Figure 5. Policies makers and preferences in the Windrum and García-Goñi model



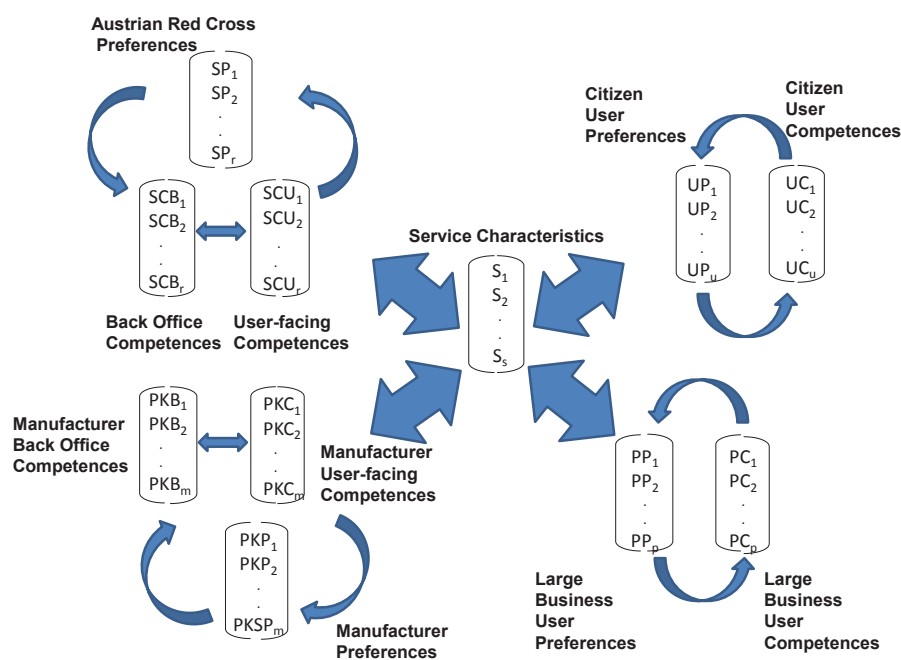
Source: Windrum and García-Goñi, 2008

This type of models is useful to illustrate real situations where strong interactions amongst agents involved lead to rich co-innovation dynamics. The ServPPIN project (Gallouj; Windrum; Rubalcaba, 2013) provided practical cases to calibrate the validity of the conceptual model. ServPPIN carried out 40 case studies between 2008 and 2009 in seven different countries across the following sectors: transport, health services, KIS, and tourism. This case study approach highlighted the importance of innovation networks over their life cycles and the development of cooperation and interaction between public and private organizations and 'third sector' organizations in developing and delivering innovative services. A major example is the health sector, where new co-innovations are increasingly outcomes from interactions between hospitals, patients, voluntary/third sector associations and policy makers. Moreover, voluntary or third sector organizations play crucial roles in intermediating between citizens and other actors to co-produce innovation (Windrum, 2014).

The next step for developing the Lancasterian contributions toward the concept of social innovation in services has been included in Windrum *et al.* (2016). In this model, "There is a long-term co-evolution of agents' competences and interests, and social innovations. The development and diffusion of social innovations requires both (a) the direct implementation of knowledge and competences of citizens and organizations (public, private or third sector), and (b) the mobilization of material and/or immaterial factors. Interactions between key stakeholders facilitate/inhibit the co-creation of social innovations, shape the features and characteristics of innovations,

and determine the extent to which the resulting innovations diffuse” (page 155). This model is built within the neo-Schumpeterian view for long run change where alterations are understood within a social evolving system that do not simply grow but qualitatively change due to social innovations. Figure 6 shows the Windrum *et al.* (2016) representation for the case behind the Austrian nationwide public access defibrillation (ANPAD) program.

Figure 6. A Multi-Agent Framework for Social Innovation in Services



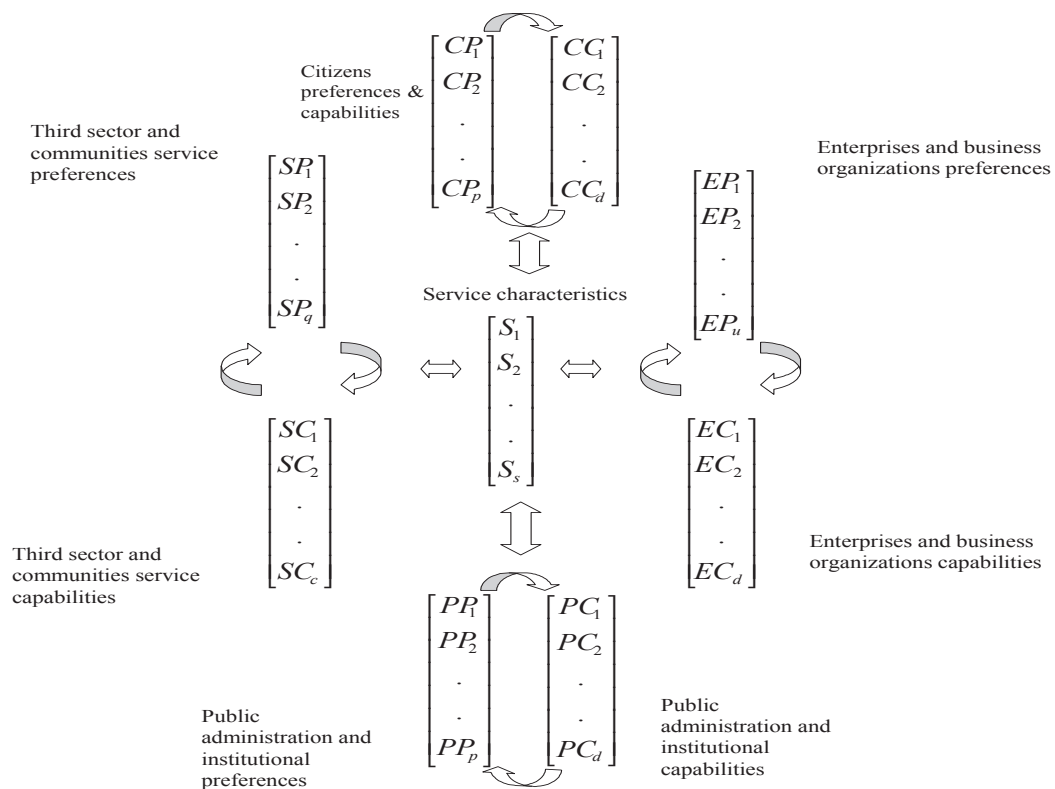
Source: Windrum *et al.* (2016)

This approach can be adapted for understanding the processes and outcomes of service, social innovation, and open innovation, as it is represented in Figure 7: it enables explicitly considering the competences and preferences of citizens, organizations, and policy makers and their interactions in the co-creation and diffusion of innovations.

The third sector represents the interests of citizens and target communities in specific innovations. The business organizations and firms represent the interests of the markets, and the policy makers represent the interests of the overall population in each country, region, or municipality. Citizens may also interact by taking part individually (e.g., social innovation through online platforms) or via third sector representation. The use of third organizations and citizens in developing social innovation in services may depend on a variety of conditions such as the sector, the country, or the social structure. This multi-agent model conveys important features of the Open Innovation approach because promoting social innovation requires extensive networking spanning organizational boundaries and driving structural changes, as well as the engagement of citizens in accelerating innovation (Curley; Salmelin, 2013).

Here, interactions between different organization types (private, public, third sector) have replaced interactions between the provider and users, stressing the open character of innovation. What matters more is the agent and the functions it can perform, so, in social and open innovation contexts, different agents can play different roles, not necessary restrictive to being supply/offer or being demand/users. The multi-agent framework developed so far can be complemented by a multiagent and multi-role framework too. In this multirole model the issue of capability become essential and include the key social innovation issue of empowerment.

Figure 7. A multi-agent and multi-role framework for social & open innovation in services



Source: Extended and adapted from earlier models by Gallouj and Weinstein (1997), Gallouj (2002), Windrum and García-Goñi (2008) and Windrum *et al* (2016)

## 5. Concluding remarks and implications for policies and metrics

This paper has explored the relationship between service innovation and social and open innovation. They are different dimensions of complementary and highly interrelated innovation processes. Their boundaries overlap, and the three concepts share a wide array of commonalities, even though they also have differences and singularities.

Open and social innovation in services can contribute to the development of the service economy in Europe because they are capable of performing different tasks in the innovation process. They can use complementarities and synergies amongst the various partners in the process of knowledge creation. They facilitate technology and demand matching by involving consumers, NGOs, and so on. They help translate social preferences not reflected by market prices into demand. They account for the growing complexity of many contexts and technologies. They support systemic innovations and transformations that require the involvement of many heterogeneous partners.

However—due to the characteristics of social, open and services innovation—market failures, allocation inefficiencies, systemic failures, or evolutionary inefficiencies may hamper innovation. The former include private underinvestment in innovation due to externalities, asymmetric information, and incomplete credit markets, market power failure due to lack of competition, economies of scale or resource immobility, and so on. The collaborative and cooperative element of the types of innovation discussed in this article makes policy rationales particularly important. Based on policy work for ServPPINs (Wazenböck *et al.*, 2013) three broad areas of policy intervention for growth and welfare contribution seem to be especially appropriate:

- Strengthening service-specific innovation and innovation capabilities,
- Facilitating cooperation and networks involving service firms, and
- Empowering the public sector and the ‘third sector’ with respect to cooperation (which is of particular importance for social innovation).

Encouraging the development of open and social innovation in services requires a horizontal service-oriented innovation policy. Service-oriented innovation policy does not necessarily need to aim at specific service sectors. Rather, it can be a horizontal policy with high sensitivity to innovation in the sectoral policy domains. Policies to boost open and social innovation in services must take the approach that promoting service innovations is a systemic need that is useful to any economic activity. Encouraging public-private innovation networks across a broad spectrum of policies is the most effective way to address that need.

So the policy should be cross-sectoral and implemented using a full range of policies. The policies would clearly include R&D policies (joint participation of public and private partners, promotion of full engagement in R&D activities vs. diffusion of knowledge, projects for further research on services, public-private interactions, innovation networks and social innovation). They would, also, include innovation policies (support for clusters and innovative industrial policies), public procurement (promotion of innovation and quality, promotion of networking between public and

private sectors) and regional policies and initiatives for innovation. Considering the impact of open and social innovation in services on other policies—such as internal markets, health, transport, tourism, and competition—helps to promote and understand their roles. Encouraging and protecting competition may be complementary to the changing role of public and private sectors in services provision. Both the European Commission and the Member States play important roles in enforcing competition and related policies, transposing and accomplishing regulations promptly, and promoting a climate receptive to giving options to the consumers of public services. Two more specific challenges for policymakers are worth mentioning here to help foster open and social innovation in services. The first has to do with taking lessons from existing social and open innovations linked to services and scale them up in the framework of systemic transformations.

On the other hand, the second, over which we will build upon the following lines, stresses the importance of devoting further efforts and research to developing meaningful metrics and indicators covering open/social/services innovation needed to measure new forms of innovation. In fact, current metrics in the form of innovation surveys are quite far from considering open and social issues. The Community Innovation Survey (CIS), which is deemed as the harmonised framework to study the existence and relevance of innovation in enterprises, includes evidence on cooperation for innovation and external sources of innovation, but fails at covering the processes of co-creation, different user-center levels of interaction, outbound-innovation forms and new open-based sources of innovation (e.g, crowdsourcing or user-centric activities, such as lead users or early adopters) as manifestations of open innovation. As for social innovation, the situation is even worse and the attempts made so far to measure its importance (always falling outside the framework of CIS) are rather fragmented (especially in terms of the statistical unit used) and rather biased on measuring macro (national/regional) issues.

In this sense, some basic guidelines may be put forward to provide help on how to increasingly incorporate social and open innovation in service innovation metrics. To our understanding, the multi-role/multi-agent model devised here could be an useful starting point to consider innovation in a more holistic form, thus identifying the amount of relevant organizations likely to participate in innovation (aside from companies) and the presence of final users and/or intermediaries (like NGOs or professional associations). The consideration of further types of impacts in questionnaires taking into account societal challenges, (possible) vulnerable groups targeted through innovation, workers' welfare or ecosystem building seem also necessary. Furthermore, there is a particular aspect deserving special attention when designing the new questionnaires: the role of the final user and the degree of interactions (from user-driven to co-innovation; from collaboration to co-value creation), as well as the increasing empowerment effect unleashed thanks to innovation on users and other partners (formal, non-formal, individual training vs eco-systems with empowerment mechanisms).

The interrelated nature of service, open and social innovation calls for creating new metrics to consider activities, sources, barriers, motivations and impacts on innovation. In this setting, indicators on activities and sources of innovation may be essentially the same (with empowerment and co-innovation as major/"umbrella" concepts), but barriers, motivations and impacts on innovation may share some common indicators (core indicators), whereas others will be inextricably associated specifically to



the particular open/social dimension considered. As a result, new scalable and contingent metrics could be created in parallel with a new version of the Oslo Manual where a more realistic and more understandable configuration of the different types of innovation may take hold (Galindo;Van Cruysen, 2016). These new metrics would give sound guidance both to organizations involved in innovation strategies and to policy makers willing to implement well targeted-policies.

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## SERVICE INNOVATION IN ENERGY EFFICIENCY CONSULTING: A BUSINESS MODEL AND SERVICE PORTFOLIO DEFINITION

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*Technology consultancies are seeking opportunities for business renewal through innovation and by developing structured service and product portfolios aimed at selected application areas to develop their competitive advantage. The objective is to introduce a business model and product portfolio creation process as well as a customer value proposition definition tools for a technology consultancy focused on energy efficiency in building and industrial applications and offer empirical insight into the creation process. The resulting product portfolio is to provide clear value for the customer, leveraging Internet-of-Things technologies as well as data analytics and machine learning.*

### 1. Introduction

Continuous innovation is a necessary part of contemporary business if long-term growth is to be maintained (Hauser;Tellis;& A., 2006).

Technology consultancies are seeking opportunities for business renewal and developing their competitive advantage. Main factors for change are both technical and business model innovation as well as structured service and product portfolios. These new offerings are targeted at selected application areas, with the aim of maintaining and developing competitive advantage, combining new technologies and solutions with existing services and competence areas.

Energy efficiency is a customer need driven by increasing cost of resources and the growing need for sustainability in business and society. Due to scarcity of resources, energy use can be considered both a cost factor and a source of competitive advantage for an organization, either from a pure cost structure point of view or on a strategic level as a key point of differentiation and factor of value proposition. Development of energy efficiency solutions in building and industrial applications is driven by the aforementioned factors and closely linked to the “Smart Building” and “Smart Factory” or related “Industry 4.0” initiatives.

The objective of this article is to introduce a business model and service product portfolio as well as an overall customer value proposition and market positioning for a technology consultancy aiming to develop energy efficiency in both building and industrial applications as well as offer empirical insight into the creation process.

Key practical industry challenges aimed to solve is the creation process and structure of a consultancy service product portfolio as well as the combination of existing consultancy services with the current state-of-the-art technologies such as internet-of-things and machine learning and advanced data analytics.

The service portfolio was created with the objective of allowing easily quantified value to be created for the customer, leveraging the internet-of-things technologies as well as data analytics and artificial intelligence and machine learning. The creation process, its challenges and tools are analyzed. One of the aims of the research is to create a model, which is transferable to other business areas of the case company; therefore the suitability of the model for reuse is evaluated.

## 2. Relationship to Existing Theory

This research is linked to and reflects three major themes in current research, the themes and their implications are listed in Table 1.

Theme	Research topic
Sustainability	Energy Efficiency, sustainable solutions
Industry 4.0, Big Data, Smart Factory & Smart Building	Use of Internet-of-Things (IoT) technology, data analytics and visualization
Strategy, Innovation, portfolio management	Portfolio creation and decisions, strategic positioning, customer value proposition

Table 1: The three major themes and their effect or application area within the research project.

### 2.1. Sustainability

The Energy Efficiency Directive 2012/27/EU (abbreviated EED) is a European Union directive which mandates energy efficiency improvements within the European Union was approved on 25 October 2012 and entered into force on 4 December 2012. The directive introduces legally binding measures to encourage efforts to use energy more efficiently in all stages and sectors of the supply chain. It establishes a common framework for the promotion of energy efficiency within the EU in order to meet its energy efficiency headline target of 20% by 2020. It also paves the way for further improvements thereafter. (European Directive, 2012) On 23 July 2014, the European Commission announced a new target of a 30% improvement in energy efficiency by 2030. (Harvey, 2014)

### 2.2. Industry 4.0 / Smart Factory/Building

Industry 4.0 is conceptual in that it sets out a way of understanding an observed phenomenon. Industry 4.0 describes the organization of production processes based on technology and devices autonomously communicating with each other along the value chain. It creates a virtual copy of the physical world and make decentralized decisions based on self-organization mechanisms. Physical objects are seamlessly integrated

into the information network, allowing for decentralized operation and real-time adaptation in the future (European Parliament, 2015). The physical world is merging with the virtual world. We are increasingly used to the internet of things, or the internet of everything and increasingly the industrial internet. They all are in the throes of digital transformation. (Deloitte, 2015) New ITC based technologies make possible this development and creates opportunities to reengineer value chains and create new business models. Internet of Things (IoT) is one of the technological fundamentals for Industry 4.0. The exponential growth of IoT connections indicates the birth of new business models and new kind of business environments. (PriceWaterhouseCoopers, 2016) This “smartness” requires greater connection and collaborations. This is where the ‘explosion’ of platforms and ecosystems is occurring. To connect all the participants to the internet of things, services, data, and people need radical redesigns within industries.

Sustainability ties business functions more closely to solving the global agenda of challenges – social, environmental and economical – and simultaneously capturing market wide opportunities. The web, and especially emerging cloud services, provides the platforms where the actions of individuals and companies can have an impact far beyond your market or industry (Salminen; Valkonen; M; & P., 2014). In this new age of the ‘linked economy,’ mobile phones and other smart technologies, sustainability can be used to ensure you are integrated with all your stakeholders anytime and anywhere. Sustainability is creating significant impact and opportunities where business, technology and innovation intersect.

### **2.3. Strategy and innovation, portfolio management**

It is easy to innovate new industrial services on the fly, but much more difficult to productize and commercialize them as service portfolio to create continuous value to customer processes. The innovation could be a short-term customer innovation, a long-term radical innovation, or a business innovation or continuous co-evolution with the customer as a life cycle innovation. Enterprises and enterprise networks seek a balance between various innovations over the offering’s life cycle. More complexity comes from whether the innovation is closed or open (Chesbrough, 2003) Internal interfaces tend to have low openness and it is usually difficult to cross the enterprise’s boundary (Chen & Liu, 2005, ss. 771-782) The interface strategies of the offering can dynamically revolute with the changing environment and time. Open innovation and the use of an innovation network is a result of the interface strategy. In many industries, the logic that supports an internally oriented, centralized approach to R&D has become obsolete. New logic behind open innovation embraces external ideas and knowledge in conjunction with internal R&D. This offers a novel way of creating value (Chesbrough, 2003)

Management of services and products in an architectural way as portfolios and through integrated modular concepts are of increasingly importance in managing the business as a whole (Salminen & Pillai, 2000). The company’s own structure and practices are at the core, consisting of product and service configurations and business processes connected with activities, competences and life cycle management, and learning and innovative culture (Prahalad & Ramaswamy, 2004)

Earlier research on product portfolio management practices in industry found 3 goals (Cooper;Edgett;& Kleinschmidt, 1997): maximizing the value of the product/project portfolio, achieving the right balance and mix of projects and linking the portfolio to business strategy.

Decision making on portfolios is not clear-cut, research has identified three major genres in decision-making procedures for product portfolios: Formalist reactive, intuitive and integrative, with companies pursuing an integrative approach found to be more successful in the end due to close integration with strategy. (Kester;Hultink;& Lauche, 2009)

Companies internally identify being successful in portfolio management have been identified in previous research as seeing portfolio management as very important activity and have formal and clearly structured procedures and processes for the activity and lastly, employ multiple different methods in a mixed approach. (Cooper;Edgett;& Kleinschmid, 1999)

Timing of search for innovations appears to be critical to competitive position of firms. Firms launching innovations after their competitors introduce a larger number of new products while companies ahead of their competitors introduce fewer but more innovative products. Most frequent innovators use both of these positions and avoid staying in sync with competitors. (Katila & Chen, 2008)

### **3. Research questions and research approach**

This applied research project uses mainly qualitative research and case study & concept creation methods combining both industrial and academic knowledge to create a business model and a structured service portfolio. Various theoretical models are evaluated for suitability for business model and product portfolio creation for this application area. The business model and service product portfolio is created in co-operation with both internal and external stakeholders and tested for validity with customers.

The main research questions are:

1. How to create a structured service/product portfolio for a technology consultancy
2. What type of service/product portfolio has the most business impact for technology consultancy focused on energy efficiency
3. How to create a valid customer value proposition for a technology consultancy
4. How to combine traditional consultancy services with internet-of-things and data analytics and machine learning technologies

The case material is focused on the case company, a Nordic technology consultancy focused on industrial, energy and building verticals. The case material was collected from a single product portfolio development project in the energy efficiency business area. Material was collected through unstructured interviews and by participating as an actor in the process and observing in workshops and other meetings.

The data and research strategy is based on a single case from a single company and single development project due to focus of the research. The time horizon is short( 6months ) due to limited length of project, creating a cross-section of the current business environment and its development initiatives.

The selected research approach is inductive due to the approach of observing the research data and creating theory from the material, rather than testing a hypothesis. The research philosophy is a realism-based but with strong interpretivistic features, focusing on qualitative data and observing reality from a natural science point-of-view, with the objective of identifying how human actors define their environmental through the tools of business development.

#### **4. Energy efficiency consultancy**

Energy can be considered a competitive factor in 40 percent of the global economy. (McKinsey&Company, 2010) Energy efficiency consulting is mainly targeted at identifying and taking advantage of possible energy savings or environmental impact changes within a process, building site or product using energy in some way.

Services provided are mainly either tailored consulting services or automated or semi-automated reporting and development tools, focusing on the key solutions for increasing energy productivity (McKinsey&Company, 2010):

- including energy efficiency in all levels and parts of organizations
- making energy consumption transparent
- making use of systematic waste detection and elimination
- incorporating energy as part of organizational key performance indicators
- continuous use of energy efficiency improvement

The main customer segments are building owners and management, industrial customers, logistics providers

Business models are consultancy services based on fixed or time based invoicing or performance based billing based on resource use or as on-going services provided via automated online systems and platforms.

From the point-of-view of the case company, main market trends in the industry in 2017 can be identified as:

- Increasing growth in need for sustainable solutions
- Smart building initiatives and distributed energy production
- Smart factory and industry 4.0 initiatives
- Growth of big data and data analytics services



## 5. Product portfolio creation process

The key objective of the case project was to create the new product and service portfolio as well as the underlying value proposition and business model.

The key assumption was that the innovation process would be a dynamic process, continuous rather than linear, incremental, interdependent and dependent on availability of resources, incentive systems, networks and constraints (Tidd, 2010)

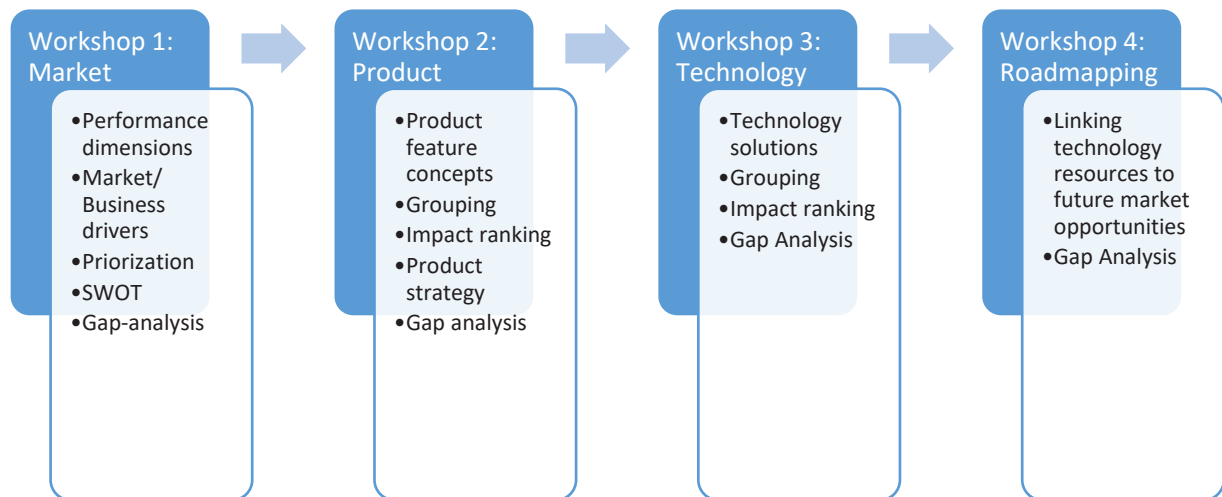


Figure 1: A proposed T- Plan structure for rapidly creating complete 3 layered roadmaps (Kostoff & Schaller, 2001)

While not strictly intended for creation of portfolios but having a wider scope of portfolios and product roadmaps the T-Plan method suggested in literature (Kostoff & Schaller, 2001) was set as the starting point for model selection and it was evaluated and trialed in the process. The model was found to have the following limitations:

- lacking a view on business strategy
- limited to creating products but still applicable to services
- easy if targeting a single customer /market segment

The redefined process used in the project is shown in Figure 2 below.

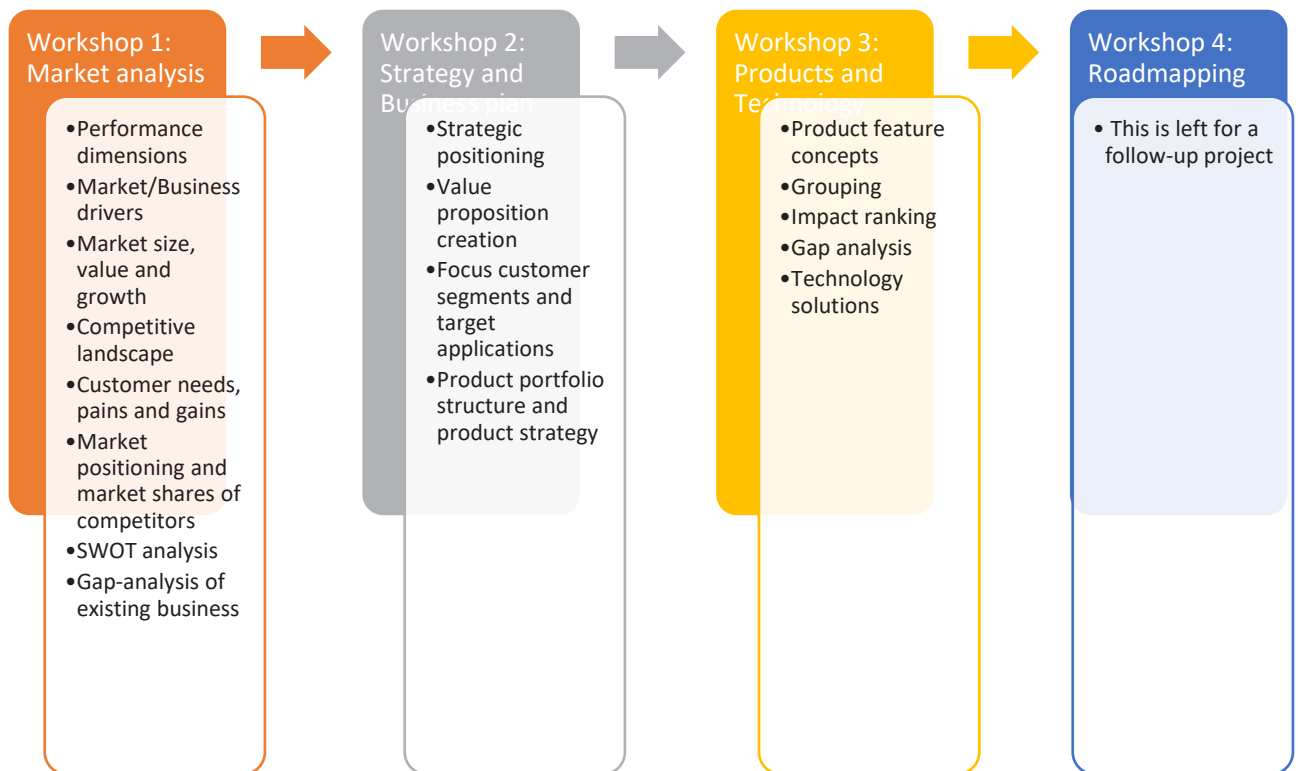


Figure 2: The modified T-plan process used to define the business model, product and service portfolio and value proposition

The key findings from the process were:

- the importance of defining strategic vision and objectives in the beginning to create clear targets for process
- clear selection of target customer segments and application areas
- Open communication between all stakeholders

Main stakeholders involved in the process were:

- Business area/strategic level management
- business unit management
- product managers from various disciplines (energy efficiency, reporting and software services)
- Internal consultants and sales force

The main target customers in both building and industrial segments were evaluated to create an understanding of the customer profile, relevant needs as well as possible gains and pain points.

## 6. Customer value proposition and portfolio definition

Value propositions are based on value elements. These are all the factors that affect the costs and benefits of the offering from the customer's point of view. These factors

may be technical, economic, service, or social in nature. (Anderson & Narus, Business Marketing: Understand What customers Value, 1998)

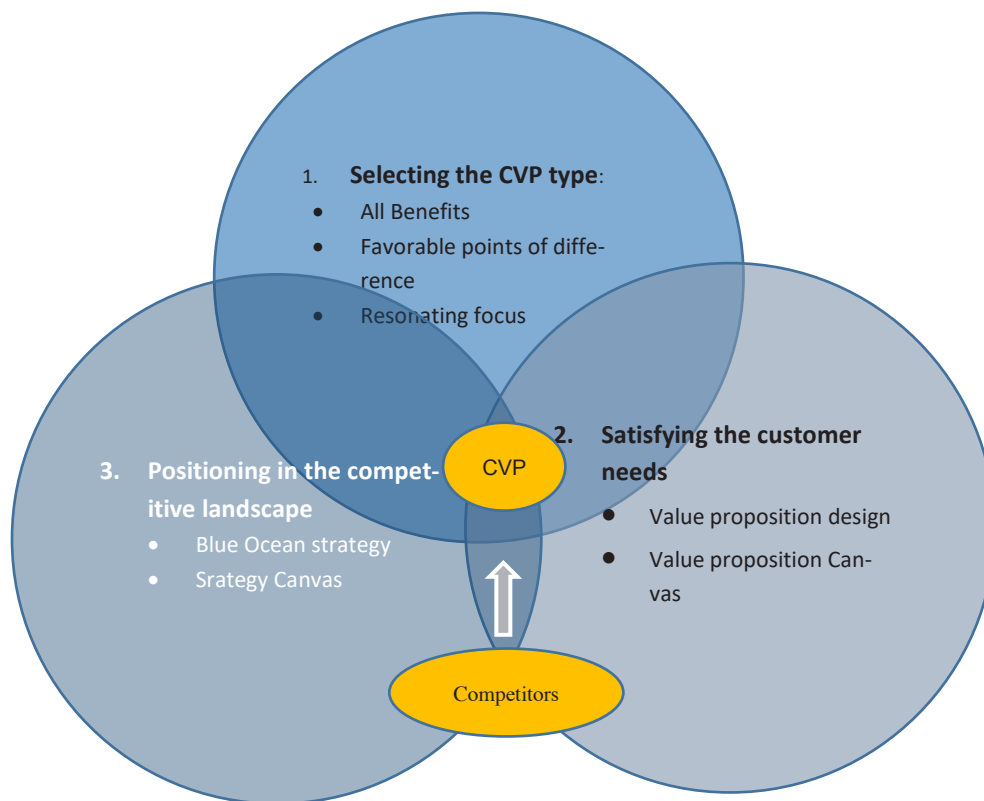


Figure 3: Different types of CVP edited from (Anderson & Narus, 1998) (Anderson;Narus;& van Rossum, 2006) (Osterwalder;Pigneur;Bernarda;& Smith, 2014)

In the research project, the value proposition definition was conducted using the following factors:

- customer needs
- competitor offering
- Available and suitable technology solutions
- relation to company strategy and adjoining business unit strategies

The chosen method is the “All benefits” method –focusing on the benefits provided to the customer and leaving comparison to competitive landscape a secondary consideration. The value proposition design was done using the constraint of changing business model from traditional consultancy to a product centric point-of-view, with a balanced mix push-pull characteristics, with a technology push from the internet-of-things and data analytics perspective combined with a pull of customer needs.

## 6.1. Strategic positioning and customer value proposition

The strategic positioning and customer value proposition within the business area were based on customer needs, company strengths as well as available partners and technologies. Table 2 outlines the customer needs identified as well as technologies identified in the initial market analysis stage using modified value proposition canvas method. (Osterwalder;Pigneur;Bernarda;& Smith, 2014).

Customer needs		Technologies
<p><b>Gains</b></p> <p>Lower costs for energy use and management</p> <p>Easier business processes</p> <p>Improved corporate image</p>	<p><b>Jobs</b></p> <p>Use and source energy as little as possible with lowest possible total net cost</p> <p>Monitor and report energy use</p>	<p><b>Data Collection</b></p> <p>Smart Energy Meters and Smart Sensors</p> <p>Mobile data collection solutions</p> <p>Data communications technologies</p>
<p><b>Pains</b></p> <p>No clear visibility into energy use</p> <p>Complex energy use system, difficult to analyze</p>		<p><b>Data Use and Analysis</b></p> <p>Data visualization tools, both mobile and desktop</p> <p>Data analytics, Learning algorithms</p> <p>Augmented reality solutions</p>

Table 2: The customer needs and technologies identified in the project as basis for creating the customer value proposition and product portfolio.

## 6.2. Service and Product Portfolio structuring

The planned product portfolio was outlined as individual services and then their underlying structure was identified using different axis as reference points. Below

Figure 4 displays the products and their relationship in terms of value creation methods.

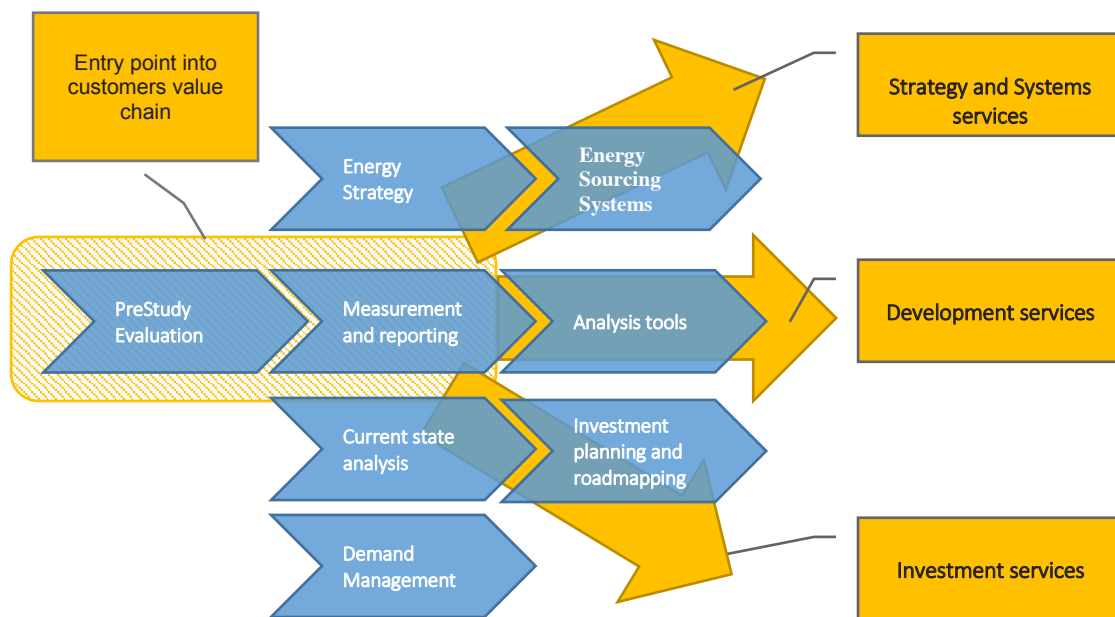


Figure 4: Service product portfolio structure in terms of products and value creation methods and value elements, products in blue and categorization in yellow

The decision-making genre chosen as the approach was integrative; with a balanced mix of quantitative and qualitative factors used to rate the products for business impact along with a strong alignment with corporate strategy. The products are grouped by category as shown in Figure 4 and ranked for overall impact using a balanced set of criteria: market size and revenue potential for case company, projected profitability, required investments and fit with strategy.

### 6.3. Use of Internet-of-things and data analytics

The suitability and impact of various new technologies listed Table 2 in was evaluated in the project. As part of product definition stage the various technologies were mapped and assigned to various services

Technology or solution	Application areas and services
Data analytics	Used in advanced development services
IoT connected sensors and meters	Used in reporting and analysis services
Data visualization	Used with reporting, analysis and strategy and systems services
Augmented reality	Not used in any of the products

Table 3: Planned Use of new technologies categorized by application area.

The overall finding was that all of the services were all connected to collection and use of data using Internet-of-things and data analytics, leading to the conclusion that expertise in these technologies is mandatory to be able to maintain a competitive position in the future.

## 7. Main Findings

The main deliverable of the project was the product portfolio and customer value propositions for the energy efficiency consulting business of a technology consultancy. The process used for creating the customer value proposition is depicted in Figure 2.

The individual products and the overall structure of the product portfolio is based on the identified customer needs and business impact and value creation methods of the individual services and products. The portfolio can be broken down into 4 major components: the customer-entry services allowing for easy access to the account, followed by a 3 pronged portfolio, focusing on investment related services, sourcing related services and services related to ongoing use of energy. The portfolio structure can be visualized along different axis, Figure 5 below displaying the value creation based view and Figure 6 shows the tiered product approach.

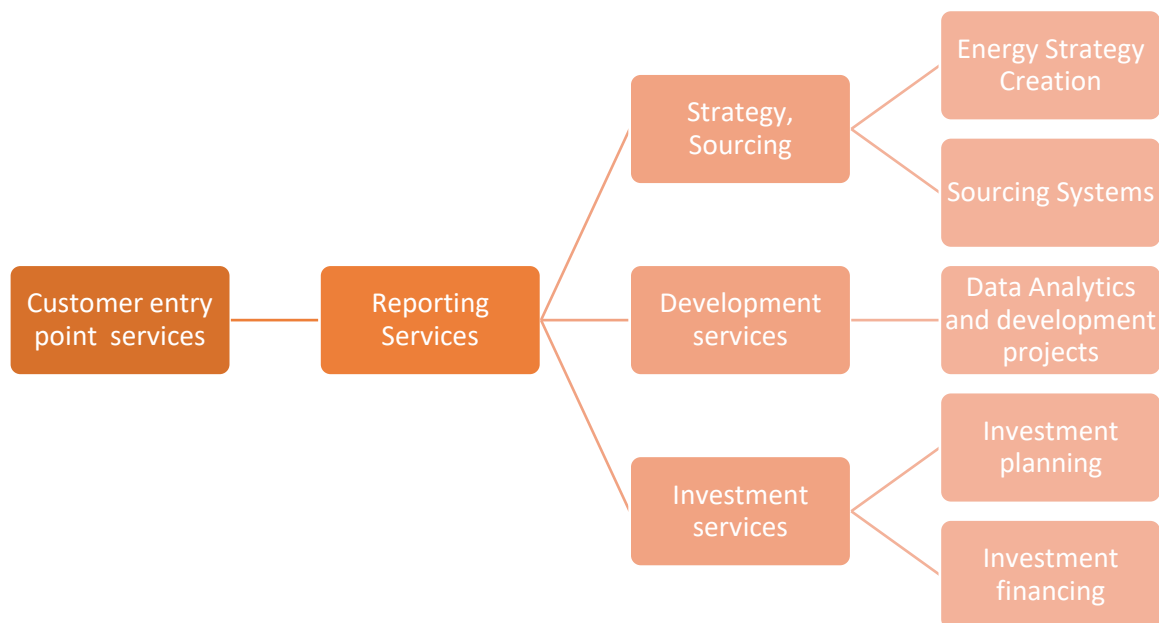


Figure 5: The structure of the defined product portfolio, value creation method point-of-view, further developed from

Figure 4.



Figure 6: The structure of the defined product portfolio, product tiered related structuring

The customer value proposition is mapped in Table 4 applying the Customer Value Proposition Canvas method, pairing the value proposition with the chosen solutions areas, relevant customer needs and an evaluation of the competitive positioning.

<b>Customer Value proposition:</b>		
<b>Customers strategic partner in reducing energy costs and consumption and corresponding environmental footprint</b>		
Solutions area	Customer needs	Competitive positioning
<b>Products</b> Energy use reporting tools Energy use analysis tools Energy use and sourcing strategy consulting services Energy related investment consulting services	<b>Jobs</b> Use and source energy as little as possible with lowest possible total net cost	<b>Favourable points of difference</b> Vendor independent online access to real-time data Advanced data analytics and machine learning
<b>Gain creators</b> Correctly planned and timed energy use development and investments	<b>Gains</b> Lower costs for energy use and management Improved corporate image	<b>Points of parity:</b> Standard consulting services related to energy certificates
<b>Pain relievers</b> Best suite of energy use and sourcing strategies Real time visibility into energy use	<b>Pains</b> No clear visibility into energy use Complex energy use systems, difficult to analyse and develop	

Table 4: The defined customer value proposition shown using a Customer Value Proposition Canvas method

## 8. Practical implications

This chapter outlines the main practical implications of the projects from the viewpoint of the case company.

The proposed service portfolio and value proposition provides the following benefits for the case company:

- Clear alignment with overall strategy
- Clear market positioning for company and business unit
- Clear go-to-market strategy with defined customer segments
- Clear product portfolio, benefitting both sales and marketing efforts
- Coordination and co-operation with all relevant stakeholders in creating and implementing new product portfolio
- Ability of offer mass-tailored standard services with an efficient service delivery structure while at the same time provide possibility for tailored, customer specific services

### 8.1. Main challenges

Main challenges identified in the process were:

- Difficulty of determining strategic positioning, vision, direction and objectives without the joint co-operation of all the stakeholders involved, leading to criticality of time resource allocation
- Related to the topic above, coordination with all the stakeholders in the process requires significant resource allocation.
- Resource allocation for both planning project work as well as determining resources for actual product creation and marketing material
- Selecting and using tools for structured market analysis is resource demanding, data collection from multiple sources, implementing in various tools as well as processing the visualizing the resources taking up significant amounts of time.

### 8.2. Fit for other business areas

The model is found to be reusable for various other consulting service businesses within the case company. The next steps are to create defined process material and templates for the implementing process.

The key change needs for implementing the model into other business areas are the definition of the value element axis to correspond with the needs of the application area targeted.



### 8.3. Key practical learnings

Main practical learnings from a business viewpoint are focused on the creation process and the challenges and limitations identified within. The main takeaways points from the project are:

- The process of corporate and company strategy creation and the strategic positioning definition on corporate must be finished and available prior to beginning work on individual business areas
- Focus of main effort should be on the joint group workshopping process rather than individual work by product managers and other stakeholders.
- Begin testing customer value proposition with customers even during creation process
- Allocate time and resources to creating related products and marketing material as well as communicating them and the overall value proposition and strategic positioning to customers and other stakeholders.

## 9. Conclusions and main contribution

Sustainability and energy efficiency combined with internet-of-things and data analytics are key drivers for business success, the value created in a network of actors involving the energy users, transmission companies and consultancies and service providers.

In the sustainability trifecta, the focus areas are the economic and environmental aspects. From the technology point-of-view the portfolio is expected include internet-of-things as well as data analytics with the aim of using them in commercially profitable service products.

The research was focused on a case project aiming to increase the competitiveness of the target company, a technology consultancy, by developing and implementing a business model and structured product and service folio to cover both building and property energy use as well as industrial process energy consumption.

One of the aims of the research was to create a model, which is transferable to other business areas of the case company; the suitability of the model for reuse was evaluated and the model and product structuring methods were found to be reusable for other business areas of the case company.

The overall impact of the research is the creation of a model combining consultancy services, energy efficiency and various new technologies into a structured service/product portfolio, together with a business model analysis and a preliminary customer value proposition.

The project main contributions from the point of view of the case company:

- Structured and reusable value proposition and product portfolio creation process, outlined in Figure 2.

- Structured offering, checked for alignment with company level strategy and selected by business impact as well as grouped by customer value creation methods, outlined in Figure 4.
- Clear customer value proposition, outlined in Table 4. From this clear value proposition the business units market positioning and go-to-market strategy can be created.
- Innovative product portfolio combining existing competences of the case company with new technologies such as Internet-of-Things and advanced data analytics. The match of technologies and related services are outlined in Table 3.

From an academic point-of-view the main research contribution is based on two main outputs of the projecting:

- Evaluation of frameworks for defining the offering of consultancy businesses, with two different axis models tested as structuring methods as shown in Figure 7 and Figure 8, product tier as well as value creation method based approaches.
- A modified model for the T-Plan method for the portfolio creation process displayed in Figure 9.



Figure 7 Product tier related structuring for service and product portfolio, with detailed descriptions of the product tiers and their content



Figure 8 Value creation method based service and product portfolio view, based on the type of customer interaction or value creation method.

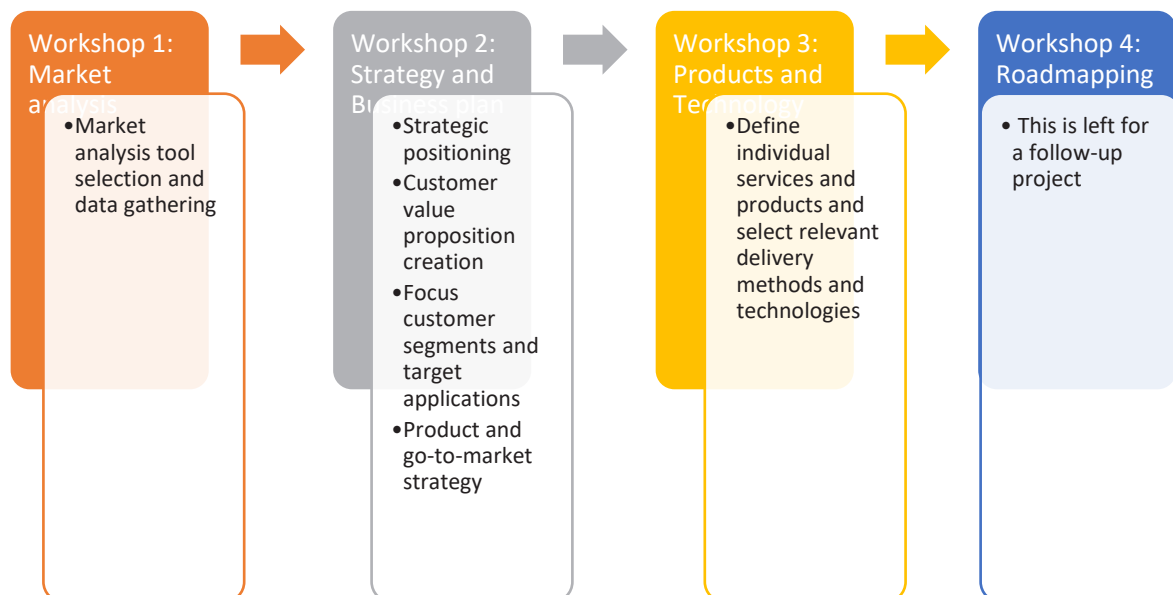


Figure 9 Modified T-Plan method used in the project, presented as a general procedure for mapping out a product portfolio and customer value propositions

Main challenges in the project were identified as being related to clear definition of strategic objectives and market positioning as well as the resource use, requiring significant collaboration and coordination with various stakeholders

The project continues after the research period with the creation of a product and technology roadmap, followed by actual service and product launches and relevant follow up and development activities.

The scope and output of the research project has been very interesting and beneficial from both practical as well as academic point-of-views and the follow-up projects are expected to be as impactful.

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# SERVICES SUPPORTING THE CUSTOMER: ACTOR CONSTELLATIONS AND INTERACTION MECHANISMS

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This paper focuses on customer and user experience of advanced service offerings, focusing mechanisms such as e.g. feedback processes as a means to utilise and learn from users' experiences. The purpose is to understand how servitization changes the constellation of actors in aftermarket value creation, and what mechanisms are needed for firms to exploit the interactions in these new constellation as a basis for service improvement and development. By studying two manufacturing firms offering advanced services, this paper points to changed actor configurations (both intra- and inter-organisational) and interaction mechanisms (existing and new) when transitioning to offering more advanced services such as "services supporting customers".

## 1. Background and introduction

Given the wide interest in servitization in general (Ostrom et al. 2015), and growth and expansion through service value-propositions and new business models in particular (Kowalkowski et al. 2017), there is an increasing interest in the firm's ability to engage with customers (Petri; Jacob, 2016) as well as the wider supply network (Chakkol et al. 2014) in developing new service offering. Today, much evidence shows how firms in sectors where physical products have been a core of the value proposition offer not only services supporting the *product* (SSP), but also services supporting *customers* (SSC) or end-users in their own internal operations (Mathieu, 2001). The manufacturer's interventions into customers own business processes extends into the "in-use" phase of the product. By these "extended services", the manufacturing firm becomes a provider of integrated product-service offerings to end-users (Windahl et al., 2004).

As servitization extends the focal point of delivery from point of sale to point of use, these providers must interact more directly with end-users to deliver value unique to the customers (Sousa; da Silveira, 2017). What previously was regarded as "after-market", guided by extensive offering of spare parts and maintenance service has now become a primary point of delivery of services that support the "in-use" phase. The consequences for this are at least twofold. First, servitization is not only bound to movement from products and services into customer-focused solutions, it also relies upon interactions amongst various actors that provide resources and/or

consume services. In particular, servitization changes the interface between the manufacturer and the end-user; current interactions between the provider, customer (a buying firm), and end users are re-configured, or even new actors become part of the service provision. The degree of servitization is related to the way by which companies operate in service networks, yet, however, the way by which these networking activities are organised “remains an open question” (Bikfalvi et al. 2013), and a relational perspective is “in its early stages” (Eloranta; Turunen, 2015). Second, such a change entails that the “products in-use” and “services supporting customers” setting becomes critical as means of understanding end user experience and capturing ideas for service development and innovations. In particular, in addition to a change of which key actors are involved in the service provision, there is need for mechanisms and capabilities to exploit the potential the *user experience* has for service development in a SSC setting. This suggests that the inter-organisational dimension of servitization is important, however, little empirical research exists that focuses on the processes by which user or customer experience is captured and processed. Further, the role of the customer, or the user, is with more advanced offerings such as SSC not limited to receiving value, rather they can also take on a more active role (Sampson; Spring, 2012; Petri; Jacob, 2016) in co-creating the value (Sousa; da Silveira, 2017). Third, we follow the suggestion by Baines et al. (2017) in that frameworks must understand how change occurs. Moreover, following the notion by Spring and Araujo (2013) that networks are “...inter-connected set of productive opportunities”, we investigate this in an inter-organizational setting. On this background, the purpose of this paper is to understand how servitization changes the constellation of actors in aftermarket value creation, and what mechanisms are needed for firms to exploit the interactions in these new constellation as a basis for service improvement and development. These issues are investigated in the context of manufacturing firms offering services and where their customer-facing activities relate to the users of their products and services (products/SSP/SSC). The purpose is decomposed into the following research questions: 1. How do intra- and inter-organisationally actor configurations - and interaction processes between them - change, when transitioning from a product focus to a focus on services supporting individuals’ use of a product? 2. What processes and mechanisms are needed in order to exploit the potentials in these new configurations as a basis for service improvement and development?

## 2. Literature and conceptual framework

A number of recent papers, both from industrial marketing and operations management branch of services management, provide a comprehensive review of the field. These constitute a general point of reference for this research. Overall, the research trajectories of the S-D logic by Pohlman and Kaartemo (2017) have also shaped the theoretical background of this paper. Further, the following cornerstones are derived for extant literature: High-tech context (Papastathopoulou; Hultink, 2012); Customer engagement (Storey et al. 2016); Interactive nature of services (Smith et al. 2014); Frequent network configuration (Spring; Araujo, 2013); Agile

combination of actors (Eloranta; Turunen, 2015); Dynamic resource configuration (Coreynen et al. 2017); Processual analysis (Baines et al. 2017).

## 2.1 Service offerings

In order to sustain the competitive advantage created by integration of services as a part of the core offering, the resources used in the service offers have to be valuable, rare, inimitable and non-substitutable (Barney, 1991). In manufacturing, such uniqueness often based on the firm having more in-depth knowledge about own products and how these are used than their competitors (Oliva; Kallenberg 2003). Deriving from a willingness to exploit this knowledge as a valuable, rare, inimitable and non-substitutable resource many firms offer services supporting the product (SSP) such as after-sales training and product monitoring (Mathieu, 2001). As more manufacturing firms view and offer SSP the competitive advantage created is limited, and firms increasingly add services supporting the customer (SSC) to their portfolio, i.e. customers that support the customer's processes in relation to the product (Mathieu, 2001), hence not only building on the firm's knowledge about their own product but also on their knowledge about customers' processes. Moving towards more complete offerings, including services such as SSP and SSC, can thus be attributed to "product bundling and extension in meeting customer needs" (Penttinen; Palmer, 2007, p. 553). A move along a continuum of offerings can be related to changed focus in two dimensions: value propositions, and main recipient.

First, classification of services along a continuum from products to more complete offerings is based on how value is created. The more basic services aiming at maintaining good product function, and the more advanced services being based on close collaboration with the customers to co-create value beyond the value inherent in the product function (Sousa; da Silveira, 2017). In other word the focus of the business model moves from being product oriented to being result oriented (Tukker, 2004). Second, there is a relational dimension moving from a focus on transactions towards a focus on relations taking place in parallel with a transition towards offering more complete and advanced offerings (Penttinen; Palmer, 2007; Sousa; da Silveira, 2017). Naturally product offerings entail a product-centric view, offering SSP entails a focus on value created by the provider through enhancing and sustaining the product function (Mathieu, 2001), and finally offering SSC means a shift to a customer centric view co-creating value unique to the customer (Sousa; da Silveira, 2017).

## 2.2 Inter-Organising: Actors, relationships, structures

Recent modes of servitization are rooted in inter-organisational relationships. Martinez et al. (2010) conclude, for example, that the nature of customer interaction becomes more "relationship-based" as companies move from product- towards product-service oriented organisations. Accordingly, value creation becomes "relationship based value creation". More recently, Raddats et al. (2017). study how



capabilities required for servitization are built through interactions in manufacturer/customer dyads. Servitization requires the skills and competences of new actors in the service supply chain, or it may alter the role of the existing ones. For example, digitalization of products and increased use of sensor technology to monitor products during the use phase introduces, for example, providers of telecommunication services as an active part of digitally connected services. Further, it also assigns a more active role (Birch-Jensen et al. 2017) to the users in assessing and developing the quality of the user-experience. In conceptualising this inter-organisational dimension, we draw upon the logic of supply chain management (e.g. Halldórsson et al. 2007) by viewing these arrangements as a structure in which services are created and delivered, and the relationships between actors in these structures constitute the means by which services are managed. By this thinking, the value propositions of the focal service provider do to a great extent rely upon interaction with external organisations in creating and delivering a service offering. This inter-organisational dimension of the framework is based upon three key premises: *Actors* that interact through *relationships* in a particular *structure* in which these relationships are managed.

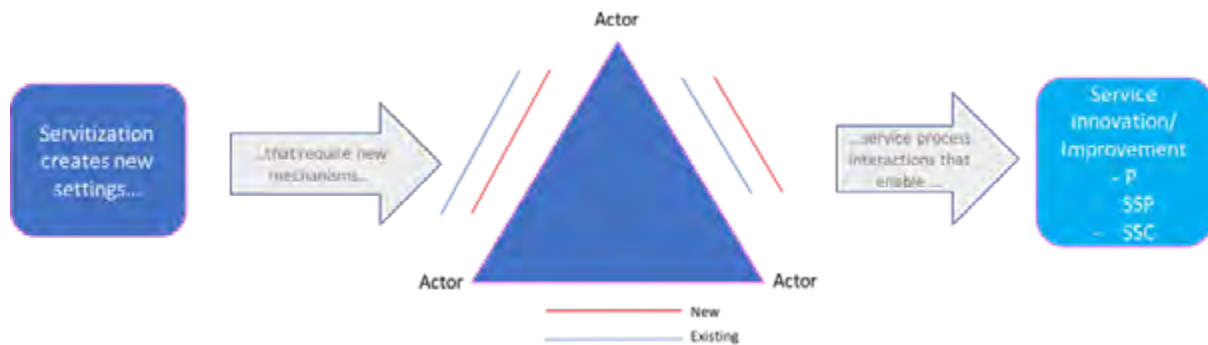
First, *actors*: The service interaction processes is partly external to the focal organisation. In this regard, Maglio and Spohrer (2013) identify a set of “key stakeholders”, and refer to a combination of “larger set of actors” as more appropriate focus than a focal company. Davies et al. (2007) refer to a “systems integrator” as the “prime contractor organization responsible for the overall system design and integrating product and service components supplied by a variety of external suppliers into a functioning system”. This relatively provider-centric approach is developed further by Storey et al. (2016) who emphasise “customer engagement”, in terms of integration and input, as important driver in the service innovation process. Moreover, Windahl and Lakemond (2010) also call for more focus on customers when analysing the interdependencies between suppliers and customers.

Second, *relationships* between actors in the service supply chain are regarded as long-term and bidirectional (Sampson, 2000; Sampson; Spring, 2012), opposite to transactional interactions. This feature is regarded as important to the transformation that servitization entails (e.g. Martinez et al. 2010; Eloranta; Turunen, 2015). Servitization assigns a more distinct role to a relationship-based approach to support “integrated offering” (Martinez et al. 2010). The transition from SSP to SSC does also suggest a more relationship based approach in that the “customer” and not the “product” is identified as key focus. Interestingly though, this long-term orientation can be seen in contrast with the dynamics created by the business environment, that require more flexibility and adaptiveness in buyer-supplier relationships. Further, although Lusch et al. 2016 ask for more dynamic approach through “service ecosystems”, it is not problematized how this should be done among the actors, and the idea of replacing one actor by another is not addressed in extant literature.

Third, *structures as level of analysis*. The service literature refers to such institutions and arrangements as “service supply chains” (Sampson; Spring, 2012), “service triads” (Wynstra et al. 2015), and even “service ecosystems” (Lusch et al. 2016). Vargo and Lusch (2016) consider the concept of “network” as “too static” to capture the dynamisms and emergence in service system, and suggest accordingly the use of “ecosystems” to capture the “systemic dynamism”. Accordingly, they define a service ecosystem as a “relatively self-contained, self-adjusting system of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange” (Vargo; Lusch, 2014, 161). These dynamic features are, however, not well articulated, and not inherently built into these inter-organizational concepts, i.e. they are not self-explanatory in this regard. By assigning learning a role in the service interaction processes that take place amongst the actors in the triads we may better understand the dynamics of these. New service development, through either SSP or SSC, requires mechanisms for learning. This can take place in the form of feedback mechanisms that facilitate the inter-organizational learning among the actors. Inter-organizational learning can be enabled by learning-by-doing (e.g. experimentation, sharing ideas with actors) and learning-from-failure (Edmondson, 2011; Mikkola, 2003). Customer feedback, particularly complaints, is one way to capture the knowledge related to failures. Bessant et al. (2003) articulate the notion to supply chain learning (SCL) to consider the ‘appropriate practice’ that might be transferred via this mechanism, which can be simple or complex involving experiment and adaptation. SSC in service triads exemplifies the shared learning with complex relationships. In supplier-buyer-customer triad, the buyer might initially act as the bridge between the supplier and the customer, but it might lose its position as the supplier gets more control of the delivering of services, such as through the control of information (Mena et al., 2013).

### **2.3 A tentative conceptual framework**

Services transcend the boundaries of both the provider and user organisation. To set the initial boundaries for conceptualisation and empirical analysis, this paper refers to the service triad as level of analysis. Focus is on the dynamisms of the triad in terms of how servitization changes the constellation of actors, and identification of mechanisms needed to exploit the interactions under the emerging or new conditions. The tentative version of the conceptual framework is summarised in Figure 1.



**Figure 1: Tentative framework - triads as generative mechanism for SSC**

Note: P: Products; SSP: Services Supporting Products; SSC: Services Supporting Customer

The framework is based upon following tenets: (i) New setting emerge as results of new technology, needs, legislation; (ii): Servitization changes the constellation of actors; (iii) A service triad provides an organisational structure in which service interaction processes take place; (iv): Advancing these interactions is needed to move from products through SSP towards SSC; (v) By this, triads are regarded as a generative mechanisms through which services are generated, improved, and even innovated; (vi) Further, to mobilise these efforts, triads become subject to constant re-configuration.

### 3. Method

The research problem investigated emerges out of the context of service management extended into the “in-use” phase. The paper provides empirical evidence for mechanisms and feedback processes within and across organisations that support service improvements and development. The study is carried out in two manufacturing companies that have established themselves as integrated product-services providers (ISP).

The sampling in this explorative phase is based upon convenience sampling, but with focus on services that allow for investigation of the user’s perspective in particular. A key criterion was to select companies that work with both what Sousa; da Silveira (2017) refer to “basic services” and “advanced services” that extend into the “in-use” phase (or the aftermarket), and where these constitute a significant part of the firm’s value propositions and offerings to their markets. A second selection criteria was a firm that works systematically with service development at and through the customer-facing part of their organisation. Further, the two firms were selected in order to capture the richness of the interplay between service offering and customer experience, enabled by technology. The study is carried out in two manufacturing companies that have established themselves as integrated product-services providers (ISP). The first case consists of an OEM of wearable medical technology (hereafter WMT), that interacts with both end-users and clinics (healthcare staff). The second case includes an OEM in the material handling equipment industry and

their customers, both of which interact with end-users. Table 1 provides an overview of contextual characteristics of each case that are considered relevant to the purpose of the paper.

**Table 1: Case companies - contextual characteristics**

	<b>Case 1: WMT</b>	<b>Case 2: MHE</b>
<b>Product</b>	<ul style="list-style-type: none"> <li>• Wearable medical technology</li> <li>• Personal care</li> <li>• High-tech, digital</li> </ul>	<ul style="list-style-type: none"> <li>• Material handling equipment</li> <li>• Technical, primarily mechanic</li> </ul>
<b>People</b>	<ul style="list-style-type: none"> <li>• User</li> <li>• Quality of life, well being</li> </ul>	<ul style="list-style-type: none"> <li>• User</li> <li>• Efficient handling, Health and safety</li> </ul>
<b>Actors</b>	<ul style="list-style-type: none"> <li>• OEM</li> <li>• Healthcare professionals/doctors</li> <li>• Telecommunication services</li> <li>• Consumers/End-users</li> </ul>	<ul style="list-style-type: none"> <li>• OEM</li> <li>• Dealers</li> <li>• Customers</li> <li>• End-users</li> </ul>

The selection of key informants was assisted by a top manager in the case companies and based upon their experience and responsibility with both services and customer-facing units, as well as ability to reflect upon the service improvement and development process in general. In addition to the researcher's prior knowledge about the two case companies (e.g. on-site visits, secondary material), a total of four interviews have been conducted so far during this exploratory phase. At WMT two interviews were conducted with the Aftermarket Manager and one interview with the product owner in charge of WMT's service offerings. At MHE interviews with the Vice President Products and Manufacturing and the Director of Sales were conducted. As a complement to the interviews and as a means of enhancing the understanding of the service offerings per se, on-line information and descriptions about the services were studied. In the case of WMT one of the services is provided as an app available in appstore/Google play, which meant that an understanding of the functionalities and customer interface could be created by downloading and browsing the app.

Credibility was addressed through an iterative process; interactions with respondents took place during both data collection in addition to follow-up through further collection of specific data as well as member checks of results. Transferability is enhanced by detailed scrutiny of the empirical context and its variety, and by synthesising results into more general and abstract relations, e.g. framework and typology (see e.g. Flick, 2014). Dependability in a qualitative inquiry aims to provide

trackable variance (rather than error or inaccuracy) that occurs due to better insight during the process of investigation, or due to the fact that changes may take place in the organisation studied (e.g. change of staff, new organisational structure). Finally, to further enhance the trustworthiness of the results, different perspectives were taken through triangulation of data (multiple sources of evidence and -respondents), a team of researchers, and multiple theoretical perspectives.

## 4. Results

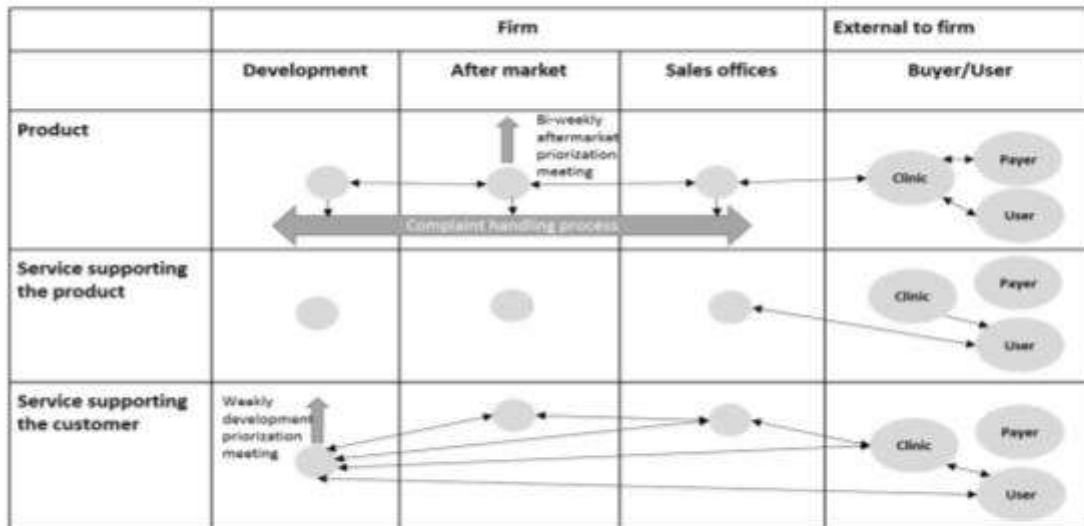
The following presents the results from the explorative phase of the study, structured around actors involved, their interactions, and three types of service offerings for each case firm (i.e. product, SSP, and SSC, cf. Figure 2 and Figure 3). As a background for this, Table 2 provides an overview of the offerings.

**Table 2: Classification of value propositions and key actors**

	<b>Case 1: WMT</b>	<b>Case 2: MHE</b>
<b>Product (P)</b>	<ul style="list-style-type: none"> <li>• Wearable medical technology</li> </ul>	<ul style="list-style-type: none"> <li>• Material handling equipment</li> </ul>
<b>Service supporting the product (SSP)</b>	<ul style="list-style-type: none"> <li>• On-call product support</li> </ul>	<ul style="list-style-type: none"> <li>• Care package (maintenance)</li> <li>• Handling efficiency</li> <li>• Warehousing optimization software</li> </ul>
<b>Service supporting the customer (SSC)</b>	<ul style="list-style-type: none"> <li>• Adjust settings through a smartphone app</li> </ul>	<ul style="list-style-type: none"> <li>• Health &amp; Safety (user)</li> </ul>
<b>Initial key actors in the service triad</b>	<ul style="list-style-type: none"> <li>• Manufacturer</li> <li>• Clinic/healthcare professionals (B2C)</li> <li>• Users (individuals)</li> </ul>	<ul style="list-style-type: none"> <li>• Manufacturer</li> <li>• Sales subsidiaries</li> <li>• Buyer (customer, B2B)</li> <li>• User (individual in customer organisation)</li> </ul>

**Case 1 - WMT:** The firm offering the WMT has about 150 000 users of their products, sold through their firm internal sales offices divided into four regions worldwide. The basis of this product is a technical innovation that at the start was unique to the market. Nowadays, there are competitors but still the firm studied is the market leader foremost in regards of the technical functionality. One way to maintain the market leading position is by offering services that enhance the customer's experiences of their product; seeing services as a core part of the offering is new to this firm as from this year. Besides offering their core product there is a variety of services offered by the firm, most of which are designed to support the use of the product (e.g. on-line support for product users) and one service supporting the

customers in their daily life (e.g. adjust settings of the device from your smart phone). Figure 2 provides an overview of the offerings and the actor configurations in the related interaction processes.



**Figure 2: Overview of the interaction processes for the WMT and the three types of offerings**

Traditionally the offering has been the product and as a high-tech company build around this technical innovation much of the mechanisms for communicating with customers, e.g. collecting, understanding, and using their feedback is based on the product logic. Internally in the firm the key actors have been the sales offices with an interface to the market, the aftermarket group of five employees and the development organization with roles as e.g. product owners. The actors externally to the firm are the clinic that diagnose the user and support them in finding a suitable device, the user in need of the device, and the buyer (i.e. the payer). The buyer is in a majority of the cases either a governmental organisation or an insurance company (depending on national context), or in very few cases the users and/or their next of kin themselves.

**P:** Offering the product to the user means that there is no direct contact between the user and the providing firm, rather the clinic always act as an intermediary. If the user has feedback or complaints on the product they contact the clinic, which contact the sales offices. In cases when there is a complaint that cannot be solved in interaction between the sales office and the clinic, the staff at the sales office registers a complaint in the formal complaint handling system (CHS). The CHS is a process that starts with an assessment of whether or not this is a patient safety issue. Later the complaint is fed back to the aftermarket group deciding about needed analysis. If a redesign of the product or other supplements like e.g. new

manuals are needed, there is a request to start a corrective and preventive action (CAPA) process filed by the aftermarket group and approved by the management team.

**SSP:** Turning to the on-call product support, a user call a specialist (specialist on both the device and the diagnosis) to get advice on how to enhance product functionality or how to solve simpler user problems. This service is provided for free, so the payer is no longer active in the interactions, and even for the clinic the role is more passive, providing information to the user that this service exists. The sales office, on the other hand, has a role that changes as the user is now in direct contact with the sales offices where the specialists are located. If there is feedback on this service that information does not reach the aftermarket group, but is regarded as a “regional sales thing” [aftermarket market manager].

**SSC:** Services designed to support the users’ everyday life are new to the firm, and the development of this type of offerings are stated to be driven mainly by competition, but also market surveys pointing to the users’ wish to be able to handle their device by themselves without visits to a clinic. Further, users’ want a discreet way of handling the device, which led to the development of a smartphone app allowing the users to adjust settings of the device. As for the on-call product support this service (app) is offered for free, hence the payer is not involved in the provision. Similarly to the product offer the clinic and user interact in support and use of the app. If problems that the clinic cannot handle occur they can, together with the user, directly contact the product owner responsible for the app. However, the clinic can also file a formal complaint through the sales office that later reaches the aftermarket group and can potentially be handled in the CHS. The user can, however, in this case also contact the product owner directly e.g. via e-mail or (anonymously) through comments in appstore/Google play. Moreover, user information is generated automatically in the form of crash reports from appstore/Google play.

Starting to offer the app to the users the firm was not prepared for the direct feedback from users, rather there was an assumption that users would still contact their clinic if problems would occur. Moreover, the requirements on the time to handle complaints was much higher for an app than for a product - current structures and processes in place (e.g. the CHS) were not fast enough. Hence, the role of the product owner became different from the role in relation to a product offer. The rather straightforward link to the market through the aftermarket and sales function was replaced by interactions with many different actors. Direct relationships to the user (on-line feedback, crash reports etc.), as well as to the clinics and sales offices (on-call support) are developed. As a response processes to support the service improvement was developed. Starting with the aftermarket group they have been assigned responsibility for formal service complaints entering through clinics, moreover the group is used by the product owner to escalate problems in their bi-weekly aftermarket prioritization meetings. In addition, there is a group in the development organisation responsible for the quality of offerings that follow up on the

automatically generated crash reports, and finally the product owner handles feedback from social media, e-mails from users, appstore comments etc. These three internal actors (aftermarket group, quality group in development, and product owner) meets weekly to prioritize issues filed in relation to the services. The issues ranked critical are assigned resources from the development organisation, disturbing issues not critical to the user are scheduled to be fixed when appropriate e.g. release of the next version, and finally training/information related issues are solved by the product owner. Still, however, there is a view that the most useful feedback is the one filed in the CHS and the firm wants to educate the users to provide feedback through the firm’s customer support or through their clinic.

**Case 2 - MHE:** The second firm studied is a full-range supplier of material handling equipment to use in customers warehouses and inventory facilities. The European branch of MHE produces more than 11.000 units at two plants that are sold to and delivered to B2B customers through sales subsidiaries fully owned by the company. More than half of the turnover is service-based, i.e. related to streams of revenue other than the physical product itself. The competitive edge is not so much price but rather supporting services, both maintenance but also effective use of the product in terms of e.g. energy efficiency, handling efficiency, and well-being of the user. This reflects the product design of the physical product as well as the services offering. Figure 3 provides three examples of offerings by MHE and the related actor configuration.

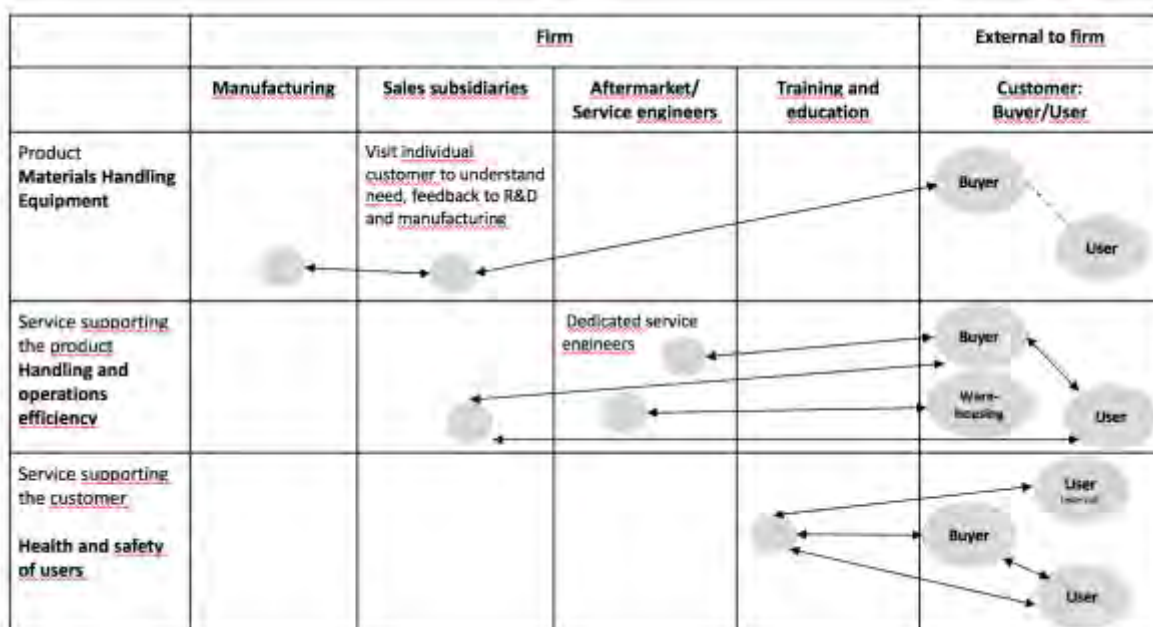


Figure 3: Overview of the points of interaction processes for MHE in three types of services



**P:** Although the products offered by MHE can also be acquired from several other companies, its processes are organised around a customer-specific production; all units are made to customer orders, and the company keeps no stock of finished goods. The company states that “modularisation is in our DNA”, and “we want to deliver something else than simply selling steel to our customers”. Instead of having a catalogue of standardized products, the company seeks to visit customers prior to sales, and to understand their operations. After feeding these needs back to R&D and manufacturing, an offer is provided to the customer. As consequence of this customisation and a zero inventory of finished goods, short lead-time has become very critical, both at the plant, and at the inbound and outbound flow of materials and finished goods, respectively.

**SSP:** The service engineers constitute the largest category of staff at MHE. The services offered can be conveniently related to the principle of total cost of ownership (TCO) of the product. The customers cost of acquiring the product is just a fraction of the TCO; maintenance counts for one third, and cost of operations (operating the equipment) for more than half of the TCO. The company observes that “the product is nothing without a high performing user”. As consequence, services to support improved efficiency of both the product in use and the customer’s operations (e.g. warehousing efficiency) have become essential to both the product design and the service offerings. SSP range from full-maintenance packages to ad-hoc visit by service engineers. These operations are guided by short lead-time of services; the majority of the on-call problems can be solved during the first customer visit, and the engineers have around 98% on-time delivery rate of spare parts into their service vans. This process has partly been automated; a sensor has been installed to the equipment to monitor and collect data about use to support the regular maintenance. In addition, customers can contact MHE directly with issues. This takes place by direct contact with a dedicated service engineer, the company has decided not to operate with a centralised call centre despite large customer base that is internationally dispersed. The service that provides a strong profile in this SSP category is “improving handling efficiency” of the materials handling equipment in the customer’s warehouse. That is, the product itself is supported in the particular operations process in which it operates, and becomes a part of performance at the customer end in terms of warehousing efficiency. This handling efficiency entails at least three types of interactions between MHE and their customers. 1. As part of standard offering, the customer is provided with guidelines of how to operate the equipment in general, i.e. “handling efficiency”, i.e. how well to solve the task at hand. 2. This is complemented by “operations efficiency”, i.e. the costs of using the equipment. Here, MHE provides customers with instructions about e.g. energy efficiency, minimizing risk of accidents, and lowering factors that likely to increase the level of maintenance required. Both 1 and 2 represent a relative provider-centric interaction, and is based upon knowledge-transfer of relatively well articulated and explicit knowledge in terms of guidelines and instructions that are available in an explicit format (e.g. writing). 3. An extension to handling and operations efficiency

are the “logistics analysis” and “warehousing simulations” that an expert from MHE conducts at the customer warehouse to see if changes can be made in layout or processes to allow for more effective use of the equipment. This is done on a more ad-hoc basis, and requires a quite personal and bi-directional interaction between the two companies, and can even result in the MHE employee spending several weeks in the customer organisation, interacting with operating functions as well as board of managers to discuss improvement efforts and investments.

**SSC:** Albeit SSP goes into the customer’s operation and entail certain degree of automation of physical processes, the services that are regarded as SSC have a firm focus on the user, i.e. the well-being of the individual that to contributes to the types of performance referred to under SSP. The operations of the equipment require frequent and repetitive movements that over a period of time have implications for the physical well-being of the individual operator. Since the establishment of the company several decades ago, a focus on the health and safety of user of the physical product and ergonomic solutions have been part of the value proposition. To support this achievement, the company has established a European training centre located in Scandinavia that offers training programs for operators. This entails a relatively formalised interaction between a dedicated unit at MHE and the users, that are both complementary and new to the patterns that emerged in P and SSP. First, in addition to receiving a certificate to operate this type of equipment, users are trained in aspects that relate to both handling and operations efficiency. More importantly, though, the training relates this to health and safety (e.g. safety rules as how to “behave” around and with this type of equipment), and ergonomic solutions. Users are offered a follow-up on this after two-three years to maintain and develop further the training.

## 5. Discussion and conclusions

The purpose of this paper was to understand how servitization changes the constellation of actors in aftermarket value creation, and what mechanisms that are needed for firms to exploit the interactions in these new constellation as a basis for service improvement and development. When the focal point of delivery shifts from point of sale to point of use, more direct interactions are needed to create unique customer value (Sousa; da Silveira, 2017). The criticality of the aftermarket as customer-interface thus increases as this is where the customers traditionally have interacted with the firm. However, to exploit the important role the aftermarket is resuming, new processes are needed to ensure customer-driven improvements and developments. Herein, inter-organizational learning serves as a mechanism for firms to improve, re-design, or design new processes for market sensing. To be effective for service innovation, these processes must be understood in relation to the structure in which they take place, i.e. service triads, since they both support and require interaction between the firm (an integrated product-service provider), customers, and end users. Moreover, as customers and users expect rapid response

and as they engage in co-creation, these processes need to be bidirectional and user-centric. The latter supporting a view of service development as no longer being firm-centric (see e.g. also Vargo et al. 2015), and enhances current body of knowledge that views service supply chains as bidirectional (e.g. Sampson; Spring, 2012) with customers being a key actor in the learning loop.

Referring to the first research question, both actor configurations and interaction processes change when offering services supporting the customer rather than the products. First, a key change is that the customers and users take on a more active role in the e.g. feedback processes. This in line with what has previously been suggested in relation to more user-centric offerings (e.g. SSC) where customers not passively receive value but also have active roles in co-creation of the value (Sampson; Spring, 2012; Petri; Jacob, 2016; Sousa; da Silveira, 2017). The cases studied is characterised by a sense of surprise and unpreparedness for the changes in the user interface following the transitions from SSP to SSC. In the case of WMT, a direct contact between customers and developers was established, bypassing the aftermarket organisation. This also created a need for new relations between the development and aftermarket organisations, clarifying areas of responsibilities and establishing new meetings and collaboration forums. The latter being an example of a new mechanism needed to handle user feedback. In summary, new relations from the user into the firm, as well as within the firm arises.

Second, certain intra-organisational functions in a firm are “shortcutted”, as the established CHS in the case of WMT. Similar ramification emerged in the second case, where SSC compared with P and SSP, entails two important extensions. First, intra-organisationally, a dedicated organisational unit is responsible for the customer (and user) interaction for the SSC services. Second, as regard inter-organisational interactions, the interaction with customers becomes more focused and direct in that this level is user-centric. Furthermore, SSC opens up for other organisations to become a part of the service triad; the training and education offering is not unique to the brand but rather the type of equipment. Accordingly, customers that have bought and use equipment from competitors send their users to the MHE training program. A certificate issued after the training is “universal” in that users are given a licence to operate the generic product, not a specific label. In summary, the dynamics of the service interactions in the external triad build upon intra-organisational adjustments through shortcutting, or by assigning the role of direct customer or user interaction to a dedicated function.

Third, a SSC perspective suggests a more explicit commitment to “users” or “user experience”. These are normally not regarded amongst the stakeholders in service system, or if so, they are seen as endogenous of “customers”. Hakanen; Jakkola (2012) refer to “customer experience”, and Maglio; Sophrer (2013) for example, define the four primary stakeholders as being customer, provider, authority, and competitor. In addition to the type of actor, the system level should also be considered. The aforementioned service ecosystem (Vargo; Lusch, 2014) imply a

focus on “institutions”, e.g. the providers’ or customers’ organisation, or their institutional arrangements (e.g. relationships in triads). The commitment to users calls for the inclusion of individuals as the system level of analysis. This may in turn call for a more behavioral approach to service development, which in line with the stream of research in operations management that is associated with ‘behavioral operations’ (see e.g. Croson et al. 2012). Future research might focus even further on this user perspective and identify “services supporting users”.

Fourth, this paper suggests a need to look at the changes implied by servitization in an aftermarket context from two dimensions in order to understand interactions and underlying mechanisms that lead to development of service offerings. First, the vertical dimension follows the hierarchical approach to definition of product and services, ranging from physical products, service supporting the product, and service supporting the customer (e.g. Oliva; Kallenberg, 2003; Coreynen et al. 2017). In this dimension, there is a need to develop feedback processes that are faster, and likely more agile, as the services differ in nature (e.g. being produced and consumed concurrently) and the users expect rapid response on feedback. The horizontal dimension presents the actors involved (e.g. Wynstra et al. 2015), that begins with the service provider as focal actor, but commits to the inter-organisational nature of the “in-use” phase by including customers (i.e. users or receivers) as well as other actors that deliver through interaction processes the service triad. This level also reflects an intra-organisational interaction in that mechanisms also contribute to the way by which customers and providers engage (see e.g. Petri; Jacob, 2016). Hence, to be able to capture feedback from users and exploit for service development, feedback processes need to become more flexible to allow for direct connection between the users and developers while still being structured enough to ensure organizational learning based on the feedback processed.

Referring to the second research question, there is a need for faster and more flexible feedback processes allowing for various ways of processing feedback from customer experience, depending on e.g. what actor that provides the feedback and in what format it is provided. If these are not in place there is a risk that improvements, as well as new service developments based on customer feedback is limited and no learning based on the feedback takes place. Compared with P and SSP, the SSC entails two important extensions. First, intra-organisationally, current functions may be by-passed by an existing function that takes on major responsibility for the customer (and user) interaction for the SSC offered. Alternatively, this can be organised through a dedicated organisational unit. Second, as regard inter-organisational interactions, the by-passing or dedicated function as described above, means that the interaction with customers becomes more focused and direct. It is though not self-evident that these interactions become bidirectional (e.g. Samspon, 2000). On one hand, dedication can result in a quite unilateral (manufacturer-to-user) view on improvement. On the other hand, SSC opens up for other organisations to become a part of the service triad during this activity.

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## SMART CITIES AND NEW SERVICES TO USERS-CITIZENS IN HEALTHCARE SYSTEMS. THE CASE OF PATIENTS' MEDICAL RECORDS : COMPARATIVE STUDY BETWEEN DIRAYA (ANDALUCIA / SPAIN) AND DMP (FRANCE)

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### Abstract

*After evoking researchers' positions and the methodology employed, we present the global context of our comparative cases' study corresponding to the challenges of e-health or health strongly disrupted by digital tools with different national specificities in France and Spain. First we point out the bad choices and defective project management for the French Electronic Health Record or DMP. Then we outline the Diraya's success in Spanish Autonomous Community of Andalusia principally through services offered to patients. We show the new perspective of these socio-technical devices and especially for the new French DMP became a shared record. They also tackle the same challenges: interoperability and new uses of sensitive data. Health is a key issue of Smart Cities and Territories. Electronic Health Records such as DMP in France or Diraya in Spain constitute interesting tools of Smart Cities and territories to develop improvement of patients' care mastering their care pathways and prevention of disease and consequently competitiveness on territories in an Economic Intelligence perspective.*

### Résumé

*Après avoir évoqué les positionnements des chercheurs et la méthodologie employée, nous présentons le contexte global de notre étude comparative de deux cas correspondant aux défis de l'e-santé ou la santé fortement bouleversée par des outils numériques avec des spécificités nationales différentes en France et en Espagne. Tout d'abord, nous soulignons les mauvais choix et la gestion de projet défectueuse pour le DMP français. Ensuite, nous décrivons le succès de Diraya dans la Communauté Autonome espagnole d'Andalousie avec des services offerts aux patients. Nous montrons les nouvelles perspectives actuelles pour ces dispositifs socio-techniques et surtout pour le nouveau DMP français devenu un dossier partagé. Il y a aussi des défis communs: l'interopérabilité et l'utilisation de données sensibles. La santé est une question clé des villes et des territoires intelligents. Les dossiers de santé électroniques tels que le DMP en France ou Diraya en Espagne constituent des outils intéressants pour développer l'amélioration des soins des patients et mieux maîtriser leurs parcours de soins et la prévention des maladies et par conséquent la compétitivité sur les territoires dans une perspective d'intelligence économique.*



## Resumen

*Después de recordar la posición de los investigadores y la metodología empleada, presentamos el contexto global de nuestro estudio comparativo: las herramientas digitales, con las diferentes especificidades nacionales de Francia y España, impactan fuertemente sobre los retos de la e-salud o salud. En primer lugar señalamos las malas decisiones y la gestión de proyecto defectuosa para el registro electrónico francés o DMP. A continuación exponemos el éxito de Diraya en la Comunidad Autónoma de Andalucía, principalmente a través de los servicios ofrecidos a los pacientes. Mostramos la nueva perspectiva de estos dispositivos socio-técnicos y especialmente para el nuevo DMP francés que se convirtió en un expediente compartido. También se abordan desafíos comunes: interoperabilidad y nuevos usos de datos sensibles. La salud es un tema clave de Ciudades o Territorios Inteligentes. Documentos electrónicos de salud como DMP en Francia o Diraya en España constituyen herramientas interesantes para desarrollar la mejora de la atención de los pacientes y la prevención de la enfermedad y, por consiguiente, la competitividad en los territorios en una perspectiva de Inteligencia Económica.*

## Introduction

Challenges in the Healthcare sector are one of the key issues facing our services' societies, particularly in the cities, with the use of information and communication technologies (ICT) to encourage the involvement of all actors, including patients, in a co-production of services perspective. They constitute an important part of "Smart Cities" projects, developing both the competitiveness and the attractiveness of these cities and their neighboring territories.

In all the developed countries, Healthcare Systems are in crisis (problems of financing and quality of care). These Healthcare Systems, which are often managed by public authorities in different manners, must be at the service of the citizens, with the imperative to focus on the patients' needs (so called patients centered).

This paper stresses this societal dimension of healthcare, which particularly concerns the cities where the huge majority of the population and of healthcare professionals are now concentrated in developed countries as in France and Spain (85 % of the population). By using ICTs, in a digital healthcare territories perspective in its French approach (TSN) to e-health, this perspective is an important part of the notion of "smart cities".

The computerized patients' records constitute a major socio-technical device to highlight the stakes of the evolution of the Healthcare Systems in the perspectives mentioned above, as well as to encourage cooperation between all the actors, the involvement of patients, and their empowerment, especially around the notion of care pathway.

We propose a comparative study of computerized patient records between France (DMP or “personal” medical record become “shared” record) and Spain through the Diraya device in the Autonomous Community of Andalusia.

First, we will show the main differences between the Spanish and French Healthcare Systems. After we will present the specificities of the two socio-technical devices analyzed: DMP in France and Diraya in Andalusia in Spain and their perspectives of evolution.

These new digital tools correspond to a crucial role of services in a coproduction way with users and constitute an important aspect of cities and territories competitiveness as “smart” cities or territories.

## 1 – Researchers’ Positions and Methodology

Our comparative study corresponding to two cases studies is first based on several previous works (see references) and a review of the literature on these issues in a more global approach to e-health in the two concerned countries. It will also be based on the analysis of documents, websites and interviews carried out at different levels with actors (principally stakeholders) and users of the two socio-technical devices studied (DMP and Diraya).

We also refer to student works within the framework of Masters in the two respective Universities of the concerned researchers. We also participate in congress or seminars developed to favor meetings of university researchers, professionals and policy makers. We position in an action research approach in a constructivist way (each actor builds his one “reality”).

In an interdisciplinary information and communication perspective of French Information and Communication Sciences we refer to F. Bernard both for the convergence of the four aspects of meaning, link (relations, interactions), knowledge and action (2006) and in the approach of “engaging communication” in a perspective of action research as neutral as possible according to N. Heinich (2006).

We begin using the way of the “Situational and Interactionist Semiotic” proposed by A. Mucchielli (2010) based of works of the group of Palo Alto’s researchers and that of E. Goffman. The “reality” of a global situation is built by the convergence of the representations of all the actors. We extend it to above only analysis of the positions of the actors to a dynamic process with the importance of meaning and contents of speeches according for example of N. D’Almeida (2006) studying organizations between speeches and projects. We position in an approach of Organizational Communication as Communication Constitutive of Organizations (CCO) stressing on the stakes of change in the organizations and with the introduction of ICT (Grosjean-Bonneville, 2011), that we propose to extend in an Information and Communication Organizing Ecosystems (ICOE) referring to Weick with the key roles of both Information and Communication. For us, Ecosystems may be both organizations (companies, associations) or territories.

We also insist on the interactions (Bègue-Desrichard, 2013) with the importance of controversies and tensions between all the actors, especially with the uses of socio-

technical devices. In a more conceptual view we refer to the approach of J. Ellul about “the ambivalence of technical progress”, in our case that of new socio-technical devices in Healthcare.

We also consider all the importance of “technical objects” or “mediator artifacts” in the steps of both Simondon and above all the “actor network theory” (Callon-Latour) considering the technical objects as “actors” or “*actants*” in a double perspective of “distributed cognition” and “situated action”. We also mobilize the “Activity Theory” (Engeström, 1999). Also with the issue of trust both in other actors and in uses of socio-technical devices: the challenge of developing cooperative ways and first removing threats (Le Cardinal and al., 2001).

And also with the challenge of apprehending socio-technical innovations both in their societal and daily / ordinary aspects (Alter, 2005) and on the territories (Godet-Mousli-Durance, 2010). We also insist on the importance of emotions and feelings (Goleman, 1995 ; Martin-Juchat, 2008) of all the actors to apprehend the development of new services in a coproduction of services perspectives, with the idea of empowerment of the patients in Healthcare.

## **2 – A Global Context: the Challenges of E-Health or Health Strongly Disrupted by Digital Tools with different National specificities in France and Spain**

The global context of our comparative study is that of e-health challenges with the great changes in healthcare with the use of new socio-technical devices both to master costs (12 % of the GDP in France and 8.5 in Spain) – if possible – to improve the quality of care, especially with the problems of medical errors, often information or communication problems.

The importance of information challenges has been outlined in the United Kingdom by the Programme “Information for Health” in the NHS (*National Health Services*) in 1998 NHS. In the United States Health Challenges have been considered as the “New Frontier” in 2005. The challenge of better producing and then better exchanging data is essential. For A. Jha (2017): “Data Science is the New Frontier for Healthcare Information Management”<sup>1</sup>.

In DICEN IDF research team we especially work on Economic Intelligence issues. We position (Bourret, 2015) in the Carayon’s report (2003) perspective: Economic Intelligence to develop Companies’ Competitiveness but also to ensure Social Cohesion. We consider that Social Welfare constitutes an important part of Economic Intelligence and implies actions for smart cities and territories using new socio-technical tools as EHR (Electronic Health Record).

<sup>1</sup> <https://us.nttdata.com/en/blog/services-perspectives/2017/april/data-science-the-new-frontier-for-healthcare-information-management-him>

But the national contexts may be different, especially that of France and Spain, corresponding to difference of the State's role (interventionism) in the management of Health issues.

In a recent congress in Rennes 2 University <sup>2</sup>, D. Alain, chief officer in ANAP <sup>3</sup> stressed that "in fact there is no Health System in France". For him, it is not possible to speak, unlike for the British NHS, of a Health System globally piloted but of a set of very different actors often acting separately and sometimes even in opposition. This is the whole issue of compartmentalization, particularly between primary care and the hospital sector, but also between the Ministry of Health and the National Health Insurance Office (CNAMTS<sup>4</sup>), between the different professions (doctors, nurses, etc.) and thus between the cure (doctors) and the care (nurses), but also between health and social, and so with the opposition between the public and the private sectors, public hospitals / private primary care physicians and private clinics.

Very divided with numerous "walls", the French Healthcare System, is also characterized by the specific weight of the hospital sector (45% of expenditure in 2016, up to 55% twenty years ago). We speak about "hospitalo-centrism" It is also deeply influenced by the specific and traditional weight of the State in France. The new Regional Health Agencies (ARS) set up in 2010 are in the responsibility of the State and not of the regions.

Here we reach the first strong difference between France and Spain. Spain opted for a decentralized approach in 17 Autonomous Communities (created in 1978) and especially in Catalonia, Bask Country or Andalusia with the specific tool Diraya.

In France, the Health System with the payment of private GP for each act realized and not in a global amount favors a curative approach, prevention receiving only 2% of the credits. H. Isaac (2014) insisted on this other French specificity, wishing that ICTs allow a shift towards the preventive care and the involvement of the patients.

### **3 – Bad choices and Defective Project Management for the first French DMP**

Launched in 2004, the DMP then Personal Medical Record (Bourret, 2007, Biedma Bourret, 2014, Dufour-Coppolani / Hassanaly 2016) pretended to be the "miracle"

<sup>2</sup> *Les Systèmes d'Information Hospitaliers (SIH) et le Dossier Médical Patient Informatisé (DMPI). La transformation de la relation de soin et les recompositions organisationnelles*, Colloque international Prefics / Vivalto, Université de Rennes 2, 8 et 9 juin 2017.

<sup>3</sup> ANAP: *Agence Nationale d'Aide à la Performance*.

<sup>4</sup> CNAMTS : *Caisse Nationale d'Assurance Maladie des Travailleurs Salariés*. This Health Insurance Office created in 1945 collects contributions both from employers and employees and uses them to finance the French Healthcare System.

tool that would revolutionize the French Healthcare System and allow it to both better master its costs and to improve the quality of care, in particular by ensuring the traceability of acts between primary care and the hospital sector and avoiding their redundancy. This DMP was created by the law of August 13, 2004 reforming the Sick Insurance, but rather surprisingly, its management was not entrusted to the CNAMTS.

It was entrusted to a particular organization set up for this purpose: the GIP (*Groupement d'Intérêt Public*) DMP. In 2009, with the very specifically French trend of creating agencies, a new agency was set up to promote its development: the ASIP (Agency for Shared Information Systems in Health).

DMP suffered from very debatable choices. First of all it was defined as a personal medical record belonging to patients. And so these patients may destroy some parts of it and give authorizations access to it. Private hosts (*hébergeurs privés*) and not public offices collected and managed the data. Also very early some people were able to talk about "bad begun record", better said in French "DMP or *Dossier Mal Part*"!

The conditions for the gathering of patient data during each medical act have not been defined. The Health Insurance refused to consider the collection of patients' data by physicians as a medical act to be reimbursed. This first DMP has also been massively rejected by so called "liberal" practitioners.

The 1996 precedent was not taken into account when so called "liberal" physicians in primary care refused to use a paper patient record for fear that it would correspond to an attempt of the Health Insurance to control and limit their acts and so their incomes. These fears have not been removed, and so general practitioners have not joined the project. The DMP's positioning and its complementarity with another computerized patients' records of the different hospital structures or interface organizations have not been very clear.

The new Healthcare Interface Organizations (HIO) that have been progressively emerged over the last thirty years (Healthcare Networks, MSP or multi-professional healthcare homes, HAD: home hospitalization, MAIA for case management of old patients especially Alzheimer's one, etc.) could have been interesting to constitute experimental spaces for the DMP.

Interesting works were carried out in 2011 by the Healthcare Networks in association with the ASIP to interface with the DMP all the documents useful for the coordination of the care and to be brought to the knowledge of the patient, personalized health products, produced as part of an organized clinical process, translating the patient's needs in a written, concerted manner with all the actors including the patient, negotiated with the patient and his / her entourage and revised periodically. They have not been continued ...

From 2004 to the end of 2015, more than ten years were lost and a lot of money wasted (not for everyone ...) ... Of the 450,000 DMP presented as "created" more than half were empty ...

## 4 – Diraya's success in Andalusia

The report published in 2015 by the European Information Security Agency and the Networks considers the Diraya information system set up by the Andalusian Healthcare System (SAS) as one of the most advanced in Europe. In Spain, the transfer of health management to the 17 Autonomous Communities began in 1981 with Catalonia. Andalusia followed in 1984 then the Basque Country in 1987. Since 2002 all the Autonomous Communities manage the health of their inhabitants.

The Diraya project began at the end of 2001. Andalusia is a very important and well-populated Autonomous Community. Its population is 8.4 million inhabitants (18% of that of Spain). Launched in 2005, Diraya quickly grew in power. As of 2008, 4900 doctors, 550 health centers, 3335 pharmacies were connected and half the population was covered. It is now fully covered.

Diraya consists of three basic components: the User Database (BDU), the Centralized Access Module (MACO) and the Structure Module (SAS, 2016). The BDU is a database that gives every citizen a unique Health History Number (NUHSA). All of its information remains linked to this database, containing the administrative data of the citizens. Through the BDU, users are identified.

The MACO is the gateway to Diraya. This module allows to identify the operators who access to Diraya. The Structure Module includes the Services and Functional Units, as well as the physical situations of the Primary and Specialized Attention. This module identifies hospital services, Primary Care centers, the physical situations of the centers, and the relationship between the two levels of assistance for the order of interconsultations and the carrying out of diagnostic tests.

In addition to these three basic components, mention should be made of the Health History Module. This module is the heart of Diraya (Martínez, 2011), and is in turn composed by the set of modules that allow the clinical information of the patient to be processed. There is also another module: Receta XXI including a Treatment Sheet with all the prescriptions indicated to the patient. It allows an electronic prescription that avoids the duty of the chronic patient to come to the health center for the renewal of the prescriptions (Martínez, 2011).

The "History of Health" is the main module of Diraya. The information is accessible to professionals who need it from any point on the network. It is shared by all the professionals who intervene at every moment to the attention, be medical, nurses or social workers, because the information must be available in any point of the network of assistance (Pérez, 2012).

Initial difficulties were overcome. As in France for the DMP, there was resistance to change and fear of control. But soon, health professionals realized that improving their coordination improved their productivity. The centralized system to manage medical appointments is highly appreciated by patients and healthcare professionals. Computerization of prescriptions and electronic prescriptions (an originality that imposed specific legislation developed by Junta of Andalusia) has reduced the number

of consultations by 15%. Savings are thus achieved. It should also be pointed out that Diraya allows epidemiological watching.

The success factors of Diraya must be emphasized. They underline the factors of failure of the French DMP. From the beginning, the objectives were clear and accepted by all the actors. The project benefited from strong policy support and continuity for the project team. Above all, more than 500 health professionals have been associated from the beginning with the design and development of the project.

Unique medical record with integrated management, Diraya has ensured immediate availability of information and unified access to all its services. Diraya's success is mainly due to the provision of services (appointments for medical professionals electronic prescriptions, virtual office through the Internet, etc.) and so its knowledge management dimension (Diraya means "knowledge" in Arabic language).

## 5 - New perspectives

### 5.1 - A New Start for the French DMP?

Article 96 of the Law of January 2016 on the "Modernization of the French Health System" has entrusted the CNAMTS with the responsibility of deploying the tool established by the law of August 2004 reforming Health Insurance but generalization has never been finalized. The CNIL<sup>5</sup> gave its agreement in July 2016 to "new modalities of creation (on-line by the patients), feeding (history of reimbursements) and consultation". At the end of 2016, a pilot phase of several months was launched with the choice of the 9 Primary Health Insurance Offices (CPAM): Bas-Rhin, Bayonne (Pyrénées-Atlantiques), Côtes-d'Armor, Doubs, Haute-Garonne, Indre-et-Loire, Puy-de-Dôme, Somme and Val-de-Marne, the only office in Ile-de-France concerned.

CNAMTS launched in spring of 2017 a large-scale operation to promote the "new" DMP. In the 9 selected departments, CPAM users can create their DMPs. Panels try to motivate them in the entrance hall of the offices, numerous leaflets are available and various gadgets distributed like mousepads, etc. The DMP will also be created by pharmacies in 2018. The CNAMTS hopes to build on the success of the "chemist record" launched a few years ago. The CNAMTS also relies on the link with the service platform Ameli.fr, with 65% of its users using it.

This new DMP is no longer "personal" but "shared", an essential change. The patient can now feed it himself. The reimbursement data held by CNAMTS are now integrated over a one-year period, which will make it possible to improve traceability. The arguments displayed in the leaflets are attractive: "With the shared medical record, you facilitate your medical follow-up ... Keep your health data online: treatments, test results, consultation reports ... Simplify transmission of your medical history during

<sup>5</sup> CNIL: *Commission Nationale Informatique et Libertés* or National Commission for Information Technology and Civil Liberties created in 1978.

your consultations ... Share them with your doctor and healthcare professionals who take care of you”.

But many problems remain. The question of the use of personal data is very sensitive with the obligation for France and Spain to integrate the new European directive by 2018 at the latest. Those of interoperability are both technical but also semantic for articulation with other records. And especially the positioning of the "new" DMP compared to other records. Is it really the "envelope-record" allowing to follow all the pathways of the patients both in primary care and in the different organizations of health (Public hospitals, private clinics, interfaces' organizations, etc.)?

The decisive questions, in the wake of Diraya's successes, are to show the importance of the services rendered and also to remove the fears, especially of the so-called "liberal" doctors on the possible use of these computerized records. Interface organizations can create spaces for confidence-building, especially if they are in the wake of the "common goods" (Ostrom, 2010) that allow private and public organizations to work together.

## 5. 2 - - Shared challenges?

The first key issue already outlined is that of the interoperability of the two studied devices: sharing data from other Autonomous Communities patients in Spain and other types of shared records (hospitals, Health Interface Organizations, pharmaceutical records, etc.) in France.

This question of interoperability also arises at European level (even if Health remains an attribute of the different National States) for mobility of citizens throughout the European Union (Epsos project for example).

Another key point is the integration in platforms. At this level we meet the issue of the "ambivalence of technical progress" (J. Ellul, 1990). Of course HER as Diraya or DMP, constitute important tools to better master patients' pathways and to develop new services favoring patients' involvement. But they also may create new risks and constraints of strong control of activities: "uberization" and suffering at work for the employees and from rationalization to rationing of care for the users.

There is also the question of controlling the flow of health information in the era of big-data, the widespread use of digital tools by citizens, including healthcare devices for augmented human, and the entry of new technologies into the home of patients, as communicating medical devices associated with services. This emerging phenomenon can lead to re-reading the concepts of envelope-record in the light of connected individuals, of the intelligent home and more generally of the intelligent or smart city, delivering to each citizen according to his capacities and abilities a possibility of e-inclusion and e-participation (new digital citizenship) in order to make him an actor of his health and well-being, but also, in connection with the open data, more informed and able to get involved in the definition of new territorial health services in new forms of empowerment and services' coproduction.



## Conclusion

This comparative study through specific cases (Diraya and DMP) is the beginning of a work in progress in a more global research about new tools to develop cooperative approaches in healthcare.

At this stage of our work, we must be aware of the limitations of the comparison between Diraya and the DMP. Diraya, as well as other computerized patient records that have had some success, such as the Quebec Health record in Canada or the computerized patient record in Denmark, concerned rather average populations: 8.4 million inhabitants for Andalusia compared to 66 million for France.

We have highlighted the importance of new services both to patients and doctors or nurses but also that of local contexts as factors of success or failure of the socio-technical devices studied: Diraya being often given as an example at the European level, the French DMP being widely controverted.

We compared the regional management of Diraya and the management of the national project of the DMP with all the importance of the involvement of the local actors in relation to a more technocentric and bureaucratic approach, and also the hospitalo-centric dimension of the French Healthcare System.

We mainly show that the involvement of the actors in the projects is a decisive factor corresponding to the expected services of permitting to overpass fears, for example that of the primary care physicians in France (paid for each medical act realized) for a greater control by the Health Insurance through the DMP, compared to the services given by Diraya with an involvement of the users from the beginning of the project.

These new digital tools constitute important examples of new uses of data in e-Health. They also correspond to a crucial role of services in a coproduction way with users and so to an important aspect of cities and territories competitiveness as “smart” cities or territories.

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# STUDIES ON SERVICE INNOVATION AND PERFORMANCE: AN ANALYSIS OF MEASURES

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*The aim of this article is to present an overview of the Brazilian and international scientific production on the relationship between innovation in services and performance, explicit indicating the units employed to measure such concepts, as well as the leading journals and authors publishing on the subject. The results show a variety of 47 journals publishing about service innovation and performance, and a group of 180 authors was responsible for the publication of the 80 articles analyzed. A great variety of metrics was used to measure performance and service innovation, being listed 48 and 38 different ones, respectively.*

## 1. Introduction

From the increasing participation of service activities in the countries' economic context (Cainelli, Evangelista, & Savona, 2006; Evangelista & Vezzani, 2010; Hsueh, Lin, & Li, 2010) studies involving service innovation and performance of organizations together has become a more prominent topic (Cainelli et al., 2006; M.-K. Chen, Lin, & Chen, 2015; den Hertog, Gallouj, & Segers, 2011; Hsueh et al., 2010; Lin, 2013).

The innovation process is a complex phenomenon (Hollenstein, 2003), and innovation in services or innovation in service's functions embody multidimensional characteristics (den Hertog et al., 2011). In general, service innovation coincides with new patterns of product distribution, interaction with the customer and ways service is delivered, taking advantage of new technologies potential, as well as entirely new business models (den Hertog et al., 2011).

There is still a lack of literature on the subject, which can be explained by the fact that service sector has long been considered to be technologically backward (Cainelli et al., 2006). Thus, the innovation phenomenon has played a marginal role explaining the aggregate performance of service sector and the companies' competitive strategies (Gadrey, Gallouj, & Weinstein, 1995; Gallouj, 2002; Gallouj & Savona, 2010; Lin, 2013). It is an area that, until then, needs further study and deepening (Cainelli et al., 2006; Evangelista & Vezzani, 2010; Hollenstein, 2003; Lin, 2013), demanding more efforts to systematize the complex nature of service innovation and its economic impact (Gallouj & Savona, 2010).

Considering the complexity and quantity of key factors that influence service innovation, usually, only those that are most strongly related to the area of interest of re-

searchers are analyzed (Hsueh et al., 2010). Therefore, the measurement and disclosure of the elements that contribute to service innovation are important issues that should be explored. However, studies indicate that the attempt to relate innovation to services and performance in organizations is still incipient (Cainelli et al., 2006; Kastalli & Van Looy, 2013; Lin, 2013; Mansury & Love, 2008).

In this context, the study of the relationship between service innovation and performance in organizations raises the question: what kind of studies are carried out relating innovation in service and organizational performance? To answer the research question, a state of the art of this relationship was structured. From the analysis of 80 papers, this article aims to present an overview of the scientific production of service innovation and organizational performance, showing the units of measurement used to measure such concepts.

The remainder of the article is organized as follows. The next section (section 2) reviews some aspects of service innovation, organizational performance, and the relationship between them. Section 3 describes the method used, and section 4 presents the results of the analysis. Finally, section 5 provides some final considerations and offers a research agenda for future studies.

## 2. Conceptual framework

### 2.1. Service innovation

Frequently, the definition of innovation includes concepts such as novelty, commercialization, and implementation. Schumpeter (1985) has dedicated himself to differentiate invention and innovation arguing that, if the first refers to an idea of something new or improved, the second predicts the generation of wealth. This statement means that if an idea wasn't developed and transformed into a product, a process, a service or has not been put on the market, it will not be considered an innovation (Popadiuk & Choo, 2006).

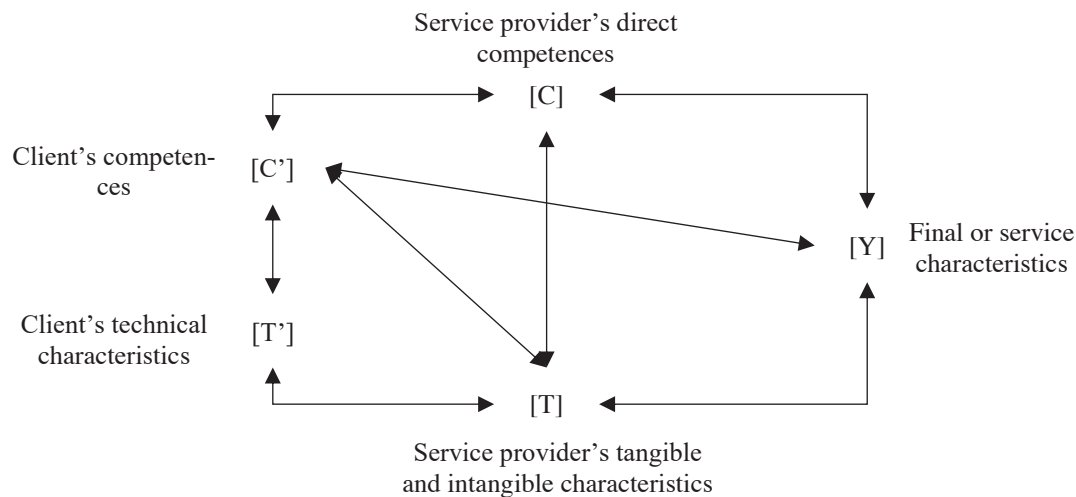
To integrate the different approaches to innovation, Baregheh, Rowley, and Sambrook (2009, 1334) define it as "the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace."

This article focuses on service innovation. In this sense, service characteristics, that is, intangible and interactive nature of the provision, absence of transfer of ownership rights, and heterogeneity, as presented by Gallouj (2007), support this work. In an integrative perspective, authors such as Gallouj and Savona (2010) and Gallouj and Weinstein (1997), seek the consolidation of models that synthesize and that can highlight innovation in goods and services.

In an attempt to provide a generic model, these authors define manufactured goods or services as a group of vectors of characteristics and competences, such as: final or service characteristics (Y) – for goods or services; service provider's tangible and intangible characteristics (T); client's technical characteristics (T'); and internal (C) and external (C') characteristics. Based on these vectors, innovation can be defined "as any change affecting one or more terms of one or more vectors of characteristics"

(C', C, T, T', Y) (Gallouj & Weinstein, 1997, p. 547), as illustrated in Figure 1. These changes come from different operations – addition, subtraction, association, dissociation and formatting of characteristics – which lead to different models of innovation: radical, improvement, incremental, ad hoc, recombinative, and formalization (Gallouj & Savona, 2010; Gallouj & Weinstein, 1997).

Fig. 1: Good/service representation as bundle of vectors of characteristics and competencies



Source: Adapted from Djellal, Gallouj, and Miles (2013)

According to Gallouj (2007, 13), Y represents services provided to customers, T are the methods, technical systems, mobilized to produce service' characteristics, and C and C' are the competences of the provider and customer, whose articulation C'C symbolizes the interface of the provision.

The next section presents an overview of organizational performance.

## 2.2. Organizational performance

The performance of an organization is directly associated to its survival and success (Asree, Zain, & Razalli, 2010), what makes it a focus of attention, determining strategies and forms of action. Considering the relevance of this topic in business studies, analyzing performance from a single or restricted approach may not contemplate its complexity since it is a multidimensional compound influenced by several aspects (Brito & Brito, 2012).

In general, performance is defined as a qualitative and quantitative evolution of products and results, reflecting improvement in efficiency related to them (Hyytinen, Ruutu, Nieminen, Gallouj, & Toivonen, 2015). From a systemic view of innovation, Hyytinen et al. (2015) attach to their definition of performance the contextual change, encompassing the difference between the initial and final situation, derived from the measured products and results.

Several variables can be used to gauge an organization's performance, and some can be used in various types of organizations, while others are more suited to particular contexts (Seashore & Yuchtman, 1967). Carneiro (2005) systematized the performance measure studies into classes, according to their main characteristics. The



first of these classes was the financial accounting measures, related to profitability, liquidity, leverage and activity indices. To analyze the economic performance of companies, Venkatraman e Ramanujam (1986) used primary and secondary sources to compare financial and operational indices, with the intention to synthesize the best form of measurement.

Other performance measures deal with consumer satisfaction and product quality. On the other hand, measures focused on internal processes are related to efficiency and effectiveness, adherence to organizational goals and resource use. Innovation and learning are also ways of approaching performance considering they are related to changes in the environment and the adaptation capacity of companies to new conditions. Besides that, there are social, environmental and behavioral performance measures (Carneiro, 2005).

To study performance as well as measure it, it is necessary to be clear about the scope of the study or to know what will be measured, which allows defining the best integrated metrics, permitting a comprehensive view. In order to ensure that performance measures are comprehensive and in line with the objectives and values of the organization and its customers, it is essential to be well acquainted with the organization in focus and its specificities (Beamon, 1999).

In general, performance has been measured using objective or subjective metrics. The former makes use of concrete, often financially-based data from organizations, and the latter are based on the respondents' perceptions about one or more performance measures (Asree et al., 2010).

### **2.3. The relationship between service innovation and organizational performance**

Different perspectives studied the positive influence of innovation on organizational performance. Some articles analyze the direct influence of innovation on the performance of the organization, others ponders its effect on the development of goods and services, analyzing the innovation's impact on performance (Aas & Pedersen, 2011; Cho & Pucik, 2005).

Service innovation can influence financial performance by reducing operational costs or increasing sales share, helping to improve the organization's profitability and increase productivity (Aas & Pedersen, 2011). Cainelli et al. (2006, 439) state that there is "a two-way self-reinforcing relationship between innovation and economic performance": on the one hand, innovation can act as a determinant for better performance; on the other hand, innovation is affected by past financial performance.

Despite the relevance of service innovation, it has been verified that its economic impact has been little studied, especially at the firm level (Cainelli et al., 2006). Innovation evaluation has typically been based on science and technology indicators, highly oriented to technological aspects and economic impacts of innovations. In particular, researchers have pointed out that the traditional way to assess and the metrics used are not capable of capturing the diversity of innovations and the multidimensional performance that exists in the service sector (Djellal & Gallouj, 2013; Hyytinen et al.,

2015). Evangelista and Vezzani (2010) reinforce that much of the literature investigating the economic impact of technological change in the last decades was characterized as possessing a manufacturing bias.

In parallel, Mansury and Love (2008) argue that studies regarding the relationship between service innovation and organizational performance are still rare, reflecting the lack of maturity in the innovation analysis in the service sector. Reflecting on the level of development of the subject in academia, these authors argue that what is lacking in the innovation literature is an explicit consideration of the direct impact of external relations of innovation on economic performance. Kastalli and Van Looy (2013) affirm that scholars recognize the need for specific metrics to measure performance and emphasize the importance of service quality, customer satisfaction, and loyalty, as well as the relationship between service provider and its customer as possible performance metrics.

### 3. Research method

The first step to conduct this work was the delimitation of criteria to be used in articles' search and selection. The search was conducted in the *Web of Science* (WoS), Scopus, Elsevier and Spell (Brazil) databases, with no temporal limitation, to cover as many articles as possible. Our survey, carried out in November of 2015, used as key words 'service innovation' and 'performance' and its correspondent in Portuguese. In order to ascertain the real relevance of the studies to the objective defined in the present article, the keywords should be mentioned on titles, keywords, and/or abstracts. Papers published in events – like meetings, conferences, among others – were not considered since they are still under construction. This procedure resulted in a set of 91 articles.

After this procedure, the 91 articles were further scanned. We analyzed the journal impact factor, which should be higher than 0,8 or Qualis Capes (for Brazilian journals) greater than B2. Additionally, to guarantee the paper consistency with the primary object of this study, we read their titles and abstracts. Those works that did not meet both criteria were excluded (11 papers), and so the final sample is composed of 80 articles.

The present work uses some of the bibliometric precepts, as the technique allows to identify and evaluate the structure and the academic production of a field of research through the use of quantitative data from a set of scientific works (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2011; Omerzel, 2016). Bibliometric, as a statistical and evaluation tool, has been useful helping to manage the information and knowledge generated by the different research areas (Andrighi, Hoffmann, & Andrade, 2011).

Finally, we analyzed also: distribution of publications over time and in which journals they were published; authors publishing; and metrics used to measure service innovation and performance. We believe that this information can contribute to the accomplishment of future research, as well as to assist researchers in the definition of the measures to be used. Next section presents and analyzes the research results.

## 4. Results

We listed 47 different journals, and a higher concentration of works in the following: Journal of Business Research (7 articles); Service Industries Journal (6 articles); Journal of Service Research (4 articles) e International Journal of Hospitality Management (4 articles). Table 1 shows the dispersion noticed in the journals.

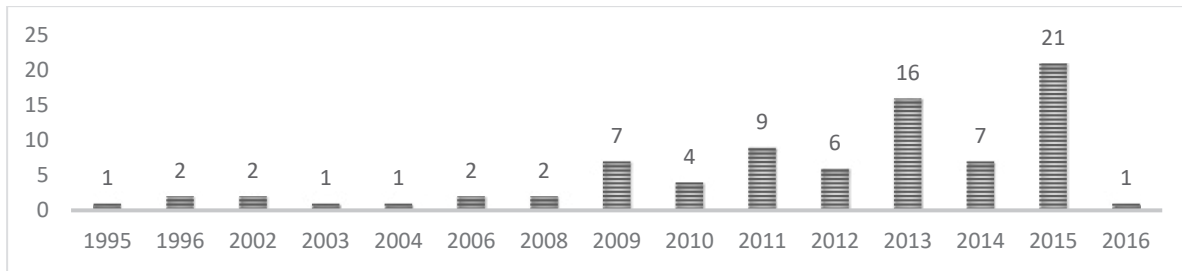
Table 1: Journals, frequency of articles per journal and impact factor

Journal	IF	F.	Journal	IF	F.
Annals of Tourism Research	2.71	1	Journal of Service Management	2.897	1
Asia Pacific J. of Tourism Research	0.99	1	Journal of Service Research	6.847	4
California Management Review	2.25	1	Journal of Service Theory And Practice	1.098	1
Computers in Human Behavior	3.435	1	Journal of Services Marketing	1.811	2
Current Science	0.843	1	Journal of Small Business Management	2.876	1
Economics and Policy of Energy and The Environment	2.58	1	J. of the Operational Research Society	1.077	1
Electronic Markets	1.864	1	Journal of World Business	3.758	1
European Management Journal	2.481	1	Management Decision	1.396	1
Health Economics	2.373	1	New Technology Work And Employment	1.0	1
Ieee Transactions On Engineering Management	1.94	2	Perspectivas Em Ciência Da Informação	B1	1
Industrial Marketing Management	3.166	3	Production Planning & Control	2.369	1
Information & Management	3.317	1	Public Administration	2.959	1
Inter. J. of Cross Cultural Management	1.54	1	R & D Management	2.444	1
Inter. J. of Hospitality Management	2.787	4	Regional Studies	2.780	2
Inter. J. Of Information Management	3.872	1	Research Policy	4.495	2
Inter. J. of Logistics Management	1.610	1	Revista de Administração e Inovação	B1	3
Inter. J. Of Operations & Production Management	3.339	1	Service Industries Journal	1.172	6
Inter. J. Of Physical Distribution & Logistics Management	2.577	1	Sport Management	2.128	1
Inter. J. of Production Economics	3.493	3	Technological Forecasting and Social Change	2.625	1
Journal of Business Research	3.354	7	Technovation	3.265	2
J. of Hospitality & Tourism Research	2.646	1	The Service Industries Journal	1.172	1
J. of Engineering and Technology Management	2.419	2	Total Quality Management & Business Excellence	1.368	2
<b>Journal of Operations Management</b>	5.207	2	Tourism Management	4.707	2
Journal of Product Innovation Management	3.759	3			

\*Note: F: absolute frequency; I.F.: Impact factor

In our survey we found works published since 1995, but no articles were identified, based on the criteria used, in the years 1997, 1998, 1999, 2000, 2001, 2005 and 2007. From 2008 on, there was a continuous sequence of publications until 2016 (search considered papers until January 2016). In the year 2013, 16 articles were identified, while in 2015 we found 21 articles. Figure 2 shows an increasing pattern of publications over the years, although there were fluctuations.

Fig. 2: Number of articles published between 1995 and 2016.



A group of 180 authors was responsible for the publication of the 80 articles, and 20 of them published more than one work in this sample. We found that four authors published three articles: Frank M. Hull, from USA Aron O’Cass e Phyra Sok, from Austrália, and Bart Van Looy, from Netherlands. It is important to mention that we considered the country reported by the authors in their most recent article in the sample.

Table 2: Authors who have published more than one work in the sample, country of origin and number of articles published

Author	Country of origin	F.	Author	Country of origin	F.
Hull, FM	USA	3	Kastalli, I. V.	Spain	2
O’Cass, A	Australia	3	Leo, PY	France	2
Sok, P	Australia	3	Love, JH	UK	2
Van Looy, B	Netherlands	3	Ordanini, A	Italy	2
AtuaheneGima, K	Hong Kong	2	Philippe, J	France	2
Castro-Lucas, C.	Brazil	2	Rubera, G	USA	2
Chang, CH	Taiwan	2	Tang, TW	Japan	2
Chen, HZ	USA	2	Visnjic Kastalli, I	UK	2
Daugherty, PJ	USA	2	Wagner, SM	Switzerland	2
Gallouj, F	France	2	Walker, RM	China	2

\*Note: F = absolute frequency

Next section presents the metrics used by the studies to measure service innovation and performance.

#### 4.1. Metrics used to measure service innovation and performance

Of the 80 articles, 77 are empirical. The three articles that do not fit into this profile bring theoretical discussions about service innovation and performance together, such as Haner (2002) that proposes a framework to analyze the concept of innovation quality, seeking to put in evidence its relationship with performance. Sousa and Guimarães (2014) hold a debate about innovation and performance focused on the Brazilian judiciary system, highlighting relationships, conceptual and methodological gaps. In a meta-analysis, Walker, Chen, and Aravind (2015) examine three questions: if the adoption of managerial innovations is beneficial to organizations; if the impact of managerial innovation on performance is close to that of technological innovation, and which are the potential sources of inconsistencies in the relationship between performance and managerial innovation.

Among the 77 empirical articles, seven did not present the metrics used to measure the constructs since they were not quantitative studies. Kastalli, Looy, and Neely (2013) used a qualitative approach to verify how service innovation impacts performance, M.-K. Chen et al. (2015) propose a framework for service quality in department stores that can be used in the formulation of service innovation strategies and help to improve performance, while Walker, Jeanes, and Rowlands (2002) qualitatively analyze innovation cases in the public sector.

Additionally, Royston, Halsall, Halsall, and Braithwaite (2003) examined NHS Direct case, stressing the innovation results obtained in this UK government agency; Tu (2012) studied the effects of internet channels (considered an innovation) on firm performance using data envelopment analysis (DEA); and Wagner and Sutter (2012) investigated relevant contingency factors in joint innovation projects in third-party logistics. Finally, Zaninelli (2013) explored qualitatively the development process of new services and the performance elements involved.

Therefore, we conducted an analysis of the metrics utilized to measure service innovation and performance using the 71 empirical quantitative studies. Initially focusing on performance metrics, we found a great variety, comprising 48 different ones. Among them, we highlight the use of sales/revenue by 20 studies, profit/profitability by 19 articles and market share by 16 studies. All metrics are listed in Table 3.

Table 3: Distribution of metrics used to measure performance and the studies that used them

	Performance metric	Article
1.	<b>Basic earning power (BEP)</b>	(Aas & Pedersen, 2011)
2.	<b>Brand equity</b>	(Cheng & Krumwiede, 2012; Yoshida, James, & Cronin, 2013)
3.	<b>Business turnover</b>	(Ferreira, Raposo, & Fernandes, 2013)
4.	<b>Client retention</b>	(Foroughi, Buang, Senik, & Hajmirsadeghi, 2015; Grisseman, Plank, & Brunner-Sperdin, 2013)
5.	<b>Competitive advantage</b>	(J.-S. Chen, Tsou, & Huang, 2009; Chong & Zhou, 2014; T. W. Tang, 2014; Tsai & Tang, 2012)
6.	<b>Competitive position</b>	(Blazevic & Lievens, 2004)
7.	<b>Corporate image</b>	(J.-S. Chen et al., 2009; Dong, Wang, Jin, Qiao, & Shi, 2014; Jiménez-Jiménez & Sanz-Valle, 2011; Thakur & Hale, 2013)
8.	<b>Corporate reputation</b>	(Blazevic & Lievens, 2004; J.-S. Chen et al., 2009; Foroughi et al., 2015; Grisseman et al., 2013)
9.	<b>Cost position</b>	(Blazevic & Lievens, 2004)
10.	<b>Cost reduction / operational costs</b>	(Aas & Pedersen, 2011; Atuahene-Gima, 1996b; Carey, Burgess Jr, & Young, 2011; den Hertog et al., 2011; Karia & Wong, 2013; Malachias & Meirelles, 2009; Tidd & Hull, 2006)
11.	<b>Cross-selling</b>	(Blazevic & Lievens, 2004)
12.	<b>Customer based performance</b>	(O'Cass & Sok, 2013)
13.	<b>Customer loyalty</b>	(J.-S. Chen et al., 2009; Cheng & Krumwiede, 2012; Thakur & Hale, 2013)
14.	<b>Customer satisfaction</b>	(Cheng & Krumwiede, 2012; Daugherty, Chen, & Ferrin, 2011; Ryu, Lee, & Choi, 2015; T. W. Tang, 2014; Yoshida et al., 2013)
15.	<b>EBIT-to-sales ratio</b>	(A. Ordanini & Parasuraman, 2011)
16.	<b>Employee service innovation behavior</b>	(Hu, Horng, & Sun, 2009)
17.	<b>Employment growth</b>	(Atuahene-Gima, 1996a; Koellinger, 2008; Mansury & Love, 2008; C. Tu, Hwang, & Wong, 2014)
18.	<b>Environmental performance</b>	(Dong et al., 2014)
19.	<b>Exports/ International performance</b>	(Castro-Lucas, Diallo, Leo, & Philippe, 2013; Love, Roper, & Hewitt-Dundas, 2010; Ryzhkova, 2015; Souza, Tavares, Souza, Philippe, & Leo, 2014)
20.	<b>Firm value</b>	(Chuang & Lin, 2015)
21.	<b>Founders satisfaction</b>	(C. Tu et al., 2014)

22.	<b>Gross value added (GVA)</b>	(Love et al., 2010)
23.	<b>Market share</b>	(Atuahene-Gima, 1996a, 1996b; Carbonell, P; Rodriguez-Escudero, A; Pujari, 2012; J.-S. Chen et al., 2009; Cheng & Krumwiede, 2012; Dai, Mao, Zhao, & Mattila, 2015; Dong et al., 2014; Gebauer, Gustafsson, & Witell, 2011; Grawe, Chen, & Daugherty, 2009; Grisseman et al., 2013; Jiménez-Jiménez & Sanz-Valle, 2011; Ku, Yang, & Huang, 2013; Lin, 2013; Malachias & Meirelles, 2009; McDermott & Prajogo, 2012; Ping-Kuo, 2014; Thakur & Hale, 2013)
24.	<b>Net equity</b>	(Aas & Pedersen, 2011; Malachias & Meirelles, 2009)
25.	<b>Net income</b>	(Eisingerich, Rubera, & Seifert, 2009)
26.	<b>New service strategy</b>	(Alam, 2006)
27.	<b>Operating income</b>	(Andrea Ordanini & Rubera, 2010)
28.	<b>Operational results</b>	(Aas & Pedersen, 2011; Dai et al., 2015)
29.	<b>Opportunity cost</b>	(Atuahene-Gima, 1996a)
30.	<b>Patent application</b>	(Dong et al., 2014)
31.	<b>Process performance/ efficiency</b>	(Atuahene-Gima, 1996a; Hsueh et al., 2010; Jiménez-Jiménez & Sanz-Valle, 2011; Melton & Hartline, 2013; Tidd & Hull, 2006);
32.	<b>Product innovation performance (goods/ services)</b>	(Chang, Chen, & Lin, 2014; Chong & Zhou, 2014; Hsieh & Hsieh, 2015; Hsueh et al., 2010; Hu et al., 2009; Hyytinen et al., 2015; Kang & Kang, 2014; Ryzhkova, 2015; Shearmur & Doloreux, 2014; Sok & O'Cass, 2011; Storey & Hull, 2010; Wagner, 2013)
33.	<b>Product mix</b>	(Malachias & Meirelles, 2009)
34.	<b>Production lead time</b>	(Kirner, Kinkel, & Jaeger, 2009)
35.	<b>Productivity</b>	(Aas & Pedersen, 2011; Jiménez-Jiménez & Sanz-Valle, 2011; Kirner et al., 2009; Love et al., 2010; Mansury & Love, 2008)
36.	<b>Profit/ profitability</b>	(Atuahene-Gima, 1996a; Carey et al., 2011; J.-S. Chen et al., 2009; Cheng & Krumwiede, 2012; Daugherty et al., 2011; Grawe et al., 2009; Grisseman et al., 2013; Jiménez-Jiménez & Sanz-Valle, 2011; Kastalli & Van Looy, 2013; Koellinger, 2008; Ku et al., 2013; Lee, Hallak, & Sardeshmukh, 2016; Lin, 2013; Martínez-Román, Tamayo, Gamero, & Romero, 2015; McDermott & Prajogo, 2012; Sok & O'Cass, 2015; Thakur & Hale, 2013; C. Tu et al., 2014; Wang, Chang, & Shen, 2015)
37.	<b>Quality</b>	(den Hertog et al., 2011; Jiménez-Jiménez & Sanz-Valle, 2011; T. W. Tang, 2014)
38.	<b>Return on Assets (ROA)</b>	(Bello, Radulovich, Javalgi, Scherer, & Taylor, 2016; Craighead, Hult, & Ketchen, 2009; Andrea Ordanini & Rubera, 2010)
39.	<b>Return on investments (ROI)</b>	(Bello et al., 2016; Cheng & Krumwiede, 2012; Daugherty et al., 2011; Eggert, Thiesbrummel, & Deutscher, 2015; Jiménez-Zarco, González-González, Martínez-Ruiz, & Izquierdo-Yusta, 2015; Lin, 2013; Ping-Kuo, 2014; Sok & O'Cass, 2015; Wang et al., 2015)
40.	<b>Return on sales (ROS)</b>	(Lin, 2013; Andrea Ordanini & Rubera, 2010; Ping-Kuo, 2014; Sok & O'Cass, 2015)
41.	<b>Rework/scrap rate</b>	(Kirner et al., 2009)
42.	<b>Sales/ Revenue/income</b>	(Atuahene-Gima, 1996a, 1996b; Bello et al., 2016; Chaston, 2011; J.-S. Chen et al., 2009; Daugherty et al., 2011; Evanschitzky, Iyer, Pillai, Kenning, & Schütte, 2015; Foroughi et al., 2015; Grawe et al., 2009; Grisseman et al., 2013; Kastalli & Van Looy, 2013; Lin, 2013; Malachias & Meirelles, 2009; Mansury & Love, 2008; McDermott & Prajogo, 2012; Melton & Hartline, 2013; Olson & Bokor, 1995; A. Ordanini & Parasuraman, 2011; Ping-Kuo, 2014; Ryu et al., 2015)
43.	<b>Sales % that comes from a new service</b>	(Kirner et al., 2009; Malachias & Meirelles, 2009; Wagner, 2013)
44.	<b>Service delivery process/Service delivery capacity</b>	(Blazevic & Lievens, 2004; Tidd & Hull, 2006)
45.	<b>Specific measures for hospitals</b>	(Carey et al., 2011) (Number of admissions, number of outpatient visits, number of outpatient surgeries, and average hospital length of stay)
46.	<b>Time compression</b>	(Tidd & Hull, 2006)
47.	<b>Tracking benefit</b>	(Tsai & Tang, 2012) (logistics)
48.	<b>Turnover (employees)</b>	(Jiménez-Jiménez & Sanz-Valle, 2011; Koellinger, 2008)

Among the 71 empirical quantitative studies, 28 articles (almost 40%) assessed performance using subjective measures, what shows that it is widely used in organizational research and can allow useful insights (Bello et al., 2016; Castro-Lucas et al.,

2013; Chaston, 2011; Cheng & Krumwiede, 2012; Chong & Zhou, 2014; Dai et al., 2015; Daugherty et al., 2011; Gebauer et al., 2011; Grawe et al., 2009; Grisseman et al., 2013; Hsieh & Hsieh, 2015; Hsueh et al., 2010; Jiménez-Jiménez & Sanz-Valle, 2011; Jiménez-Zarco et al., 2015; Ku et al., 2013; Lee et al., 2016; McDermott & Prajogo, 2012; Melton & Hartline, 2013; O’Cass & Sok, 2013; Ryu et al., 2015; Sok & O’Cass, 2011, 2015; T.-W. Tang, 2015; T. W. Tang, 2014; Thakur & Hale, 2013; Tsai & Tang, 2012; C. Tu et al., 2014; Wang et al., 2015).

About service innovation measures, some articles did not mention them since they consider a given innovation phenomenon and measure other constructs (Blazevic & Lievens, 2004; Carey et al., 2011; Chong & Zhou, 2014; Evanschitzky et al., 2015; Hsieh & Hsieh, 2015; Kastalli & Van Looy, 2013; Andrea Ordanini & Rubera, 2010; Royston et al., 2003; Tsai & Tang, 2012; H.-J. Tu, 2012); or they presume that the studied company is innovative (Jiménez-Zarco et al., 2015). The most used metrics to measure service innovation are related to product innovation - goods or services (23 studies), and process innovation (7 studies). Table 4 summarizes the metrics.

Table 4: metrics used to measure service innovation and the studies that used them

	Innovation metric	Article
1.	Balanced service innovation	(Sok & O’Cass, 2015)
2.	Combined service innovation	(Sok & O’Cass, 2015)
3.	Customer service innovation	(Karia & Wong, 2013; Lin, 2013)
4.	Eco-innovation	(Dong et al., 2014)
5.	Exploitation Innovation	(McDermott & Prajogo, 2012; Sok & O’Cass, 2015)
6.	Exploration Innovation	(McDermott & Prajogo, 2012; Sok & O’Cass, 2015)
7.	Incremental innovation	(Cheng & Krumwiede, 2012; Ryzhkova, 2015)
8.	Innovation advantage	(Atuahene-Gima, 1996a)
9.	Innovation capacity/ innovation capability	(Craighead et al., 2009; Daugherty et al., 2011; Ferreira et al., 2013; Grawe et al., 2009; O’Cass & Sok, 2013; Sok & O’Cass, 2011; T.-W. Tang, 2015)
10.	Innovation environment	(Malachias & Meirelles, 2009)
11.	Innovation factors	(Ferreira et al., 2013)
12.	Innovation fit	(Atuahene-Gima, 1996b) – marketing and technology
13.	Innovation focus	(Eisingerich et al., 2009; Ryu et al., 2015)
14.	Innovation intensity	(Castro-Lucas et al., 2013)
15.	Innovation newness	(Atuahene-Gima, 1996a, 1996b; Carbonell, P; Rodriguez-Escudero, A; Pujari, 2012; Lee et al., 2016; Martínez-Román et al., 2015)
16.	Innovation orientation/ innovative orientation	(J.-S. Chen et al., 2009; Eisingerich et al., 2009; A. Ordanini & Parasuraman, 2011)
17.	Innovation resources	(Sok & O’Cass, 2011)
18.	Innovation source	(Wagner, 2013)
19.	Innovation success	(Love et al., 2010)
20.	Innovative profile/ innovation behavior	(Grisseman et al., 2013; Malachias & Meirelles, 2009)
21.	Innovativeness	(Bello et al., 2016; Gebauer et al., 2011; Grisseman et al., 2013; Yoshida et al., 2013)
22.	Managerial/organizational innovation	(Aas & Pedersen, 2011; Jiménez-Jiménez & Sanz-Valle, 2011; Lee et al., 2016; Love et al., 2010; Shearmur & Doloreux, 2014)
23.	Marketing innovation	(Aas & Pedersen, 2011; Lee et al., 2016; Love et al., 2010; Shearmur & Doloreux, 2014)
24.	New service advantage	(Carbonell, P; Rodriguez-Escudero, A; Pujari, 2012)
25.	New service development (NSD)	(Alam, 2006; Cheng & Krumwiede, 2012; Hu et al., 2009; Melton & Hartline, 2013; Storey & Hull, 2010)
26.	New technology	(Lin, 2013)
27.	Number of innovations per year	(A. Ordanini & Parasuraman, 2011)
28.	Open innovation	(Chaston, 2011; Foroughi et al., 2015; Wang et al., 2015)
29.	Organization of innovation process	(den Hertog et al., 2011)

	Innovation metric	Article
30.	Process innovation	(Aas & Pedersen, 2011; Chuang & Lin, 2015; Galanou & Farrag, 2015; Jiménez-Jiménez & Sanz-Valle, 2011; Koellinger, 2008; Lee et al., 2016; Ryzhkova, 2015; Shearmur & Doloreux, 2014)
31.	Product innovation (goods and services)	(Aas & Pedersen, 2011; Atuahene-Gima, 1996b; Chang et al., 2014; Chong & Zhou, 2014; Chuang & Lin, 2015; Dai et al., 2015; Daugherty et al., 2011; Eggert et al., 2015; Galanou & Farrag, 2015; Jiménez-Jiménez & Sanz-Valle, 2011; Kastalli & Van Looy, 2013; Koellinger, 2008; Ku et al., 2013; Lee et al., 2016; Lin, 2013; Love et al., 2010; Mansury & Love, 2008; Melton & Hartline, 2013; Ryzhkova, 2015; Shearmur & Doloreux, 2014; Sok & O'Cass, 2011; Souza et al., 2014; T. W. Tang, 2014; Tidd & Hull, 2006; C. Tu et al., 2014)
32.	Radical innovation	(Cheng & Krumwiede, 2012; Ryzhkova, 2015)
33.	Service delivery innovation	(J.-S. Chen et al., 2009; Lin, 2013)
34.	Service innovation culture	(W. J. Chen, 2011)
35.	Service innovation strategy	(Carbonell, Rodriguez-Escudero, & Pujari, 2012; Ryu et al., 2015)
36.	Speed of service innovation	(Ping-Kuo, 2014)
37.	Strategic innovation	(Love et al., 2010)
38.	Types of innovation	(den Hertog et al., 2011)

Observing tables 3 and 4, we notice the dispersion and variety of metrics used by the studies to measure performance and service innovation. It is possible that it occurs because of the inexistence of agreement about the definitions and, as consequence, the metrics that should be used. Also, each type of service that is analyzed can demand different measures, what culminates in the reported multiplicity. However, the development of several models and measures hinders to aggregate the results and analyze them together (O'Reilly III, Caldwell, Chatman, & Doerr, 2014). Besides, it is worth to remember Gallouj e Savona (2010) statement, which affirms that it is necessary to make an effort to systematize the complex nature of service innovation and its economic impact.

## 5. Concluding remarks and research agenda

The present paper had as the primary goal to show a panorama of the scientific production of service innovation and performance of organizations, evidencing metrics used to measure these concepts. We believe that this objective was achieved. The journals that published more on the subject were listed (Journal of Business Research, Journal of Service Research, Journal of Service Research, International Journal of Hospitality Management), as well as a distribution of the publication over 21 years (1995 to 2015, encompassing one study from 2016). Amongst the countries that have the largest number of authors researching the topic are Taiwan (35 authors) and USA (30 authors). Brazil has eight authors who have published articles that fitted the search criteria established.

Among metrics used to measure performance, the most used ones were sales/revenue (20 studies) and profit/profitability (19 studies). Almost 40% of the 71 empirical-quantitative articles applied subjective performance measures. Regarding the metrics of service innovation, there is also a great variety, being the most used those measures related to product innovation (goods and services) and process innovation. The existence of this diversity of approaches and metrics, brings difficulties in the consolidation of generated knowledge, leading to a theoretical fragmentation of the discipline (McKinley, 2010). Therefore, it is necessary to carry out studies aiming the



consolidation of metrics to measure innovation in services and, in parallel, to establish the relationship between innovation in services and the performance of organizations in a clear way. New studies would contribute to the deepening of the theme and the advancement of knowledge on the subject, favoring the formation of a consolidated theoretical body in service innovation area.

Regarding the suggestions of future research, we present some opportunities to deepen studies, to undertake new or to consider different units of analysis to ascertain the relation between the concepts service innovation and organizational performance. Among the possibilities is the accomplishment of longitudinal studies, which allow to examine in greater depth the relationships and consequences of service innovation in organizational performance, as indicated in different articles (see Dai et al., 2015; Gebauer et al., 2011; Hsueh et al., 2010; O’Cass & Sok, 2013; A. Ordanini & Parasuraman, 2011; Storey & Hull, 2010; T.-W. Tang, 2015; Wagner, 2013). The accomplishment of longitudinal studies is a much-quoted research opportunity, especially because cross-sectional studies undermine the capture of a causal relationship between service innovation and performance.

Other works suggest the replication of their studies with larger samples and/or in different contexts (Castro-Lucas et al., 2013; Eisingerich et al., 2009; McDermott & Prajogo, 2012; Ryzhkova, 2015; H.-J. Tu, 2012), such as in different firms (Atuahene-Gima, 1996a, 1996b; Olson & Bokor, 1995), diverse economic sector (J.-S. Chen et al., 2009; Daugherty et al., 2011; Hsueh et al., 2010; Kastalli & Van Looy, 2013; Malachias & Meirelles, 2009; A. Ordanini & Parasuraman, 2011; Thakur & Hale, 2013; Wang et al., 2015), as well as other countries (Aas & Pedersen, 2011; Atuahene-Gima, 1996b; Carbonell, P; Rodriguez-Escudero, A; Pujari, 2012; J.-S. Chen et al., 2009; Cheng & Krumwiede, 2012; Daugherty et al., 2011; Gebauer et al., 2011; Koellinger, 2008; A. Ordanini & Parasuraman, 2011; Wagner, 2013), intending to ratify or rectify research findings or stimulate the comparison of the results obtained under different conditions.

Also, future studies can identify and analyze the influence of the relationships of stakeholders (clients, employees, among others) between themselves and with the organization, and how this relationship reflects on the production of new services and organization's performance (J.-S. Chen et al., 2009; Grisseemann et al., 2013; Karia & Wong, 2013; Ku et al., 2013; C. Tu et al., 2014; Wagner & Sutter, 2012). One can also evaluate the relationship between co-creation with different stakeholders and innovation (Hsieh & Hsieh, 2015), or even identify the role of consumers in the development of new services (Alam, 2006; Carbonell, P; Rodriguez-Escudero, A; Pujari, 2012).

Another option is to examine knowledge in supply chains and, comparatively, radical and incremental innovations and their effects on performance (Craighead et al., 2009). Storey and Hull (2010), on the other hand, suggest a longitudinal study focused on showing how companies adapt their strategies of knowledge over time and how this affects the innovation ability of service companies.

Carey et al. (2011) and Foroughi et al. (2015) propose studies on the relationship between competition and development of new products, services, and their influence on company performance. Hsieh and Hsieh (2015) suggest examining the relationship between service innovation activities and service innovation itself over time.

A recommendation made by some authors (W. J. Chen, 2011; Chuang & Lin, 2015; Ferreira et al., 2013; A. Ordanini & Parasuraman, 2011) is to evaluate the influence of organizational and national culture in the context of innovation. Open innovation and its specificities were indicated as a subject of future studies by Wang, Chang e Shen (2015), as well as the eco-innovation, by Dong et al. (2014) and the influence of quality of innovation in results, by Jiménez-Jiménez and Sanz-Valle (2011).

Grawe et al. (2009) suggest that should be evaluated the impact of a company's strategic orientation on its innovation capacity, as well as the identification of other internal or external factors that contribute to the development of service innovation capacity. In addition, one could investigate the differences between the capacity for innovation in services and other types of innovation, such as goods or process. Another research path is to explore the role of dynamic capabilities (the company's ability to reconfigure its resources to adapt to environmental changes) in the innovation process and its impact on performance (Ordanini & Rubera, 2010). Tang (2014) also suggests studies that explore the balance between complementary service capabilities - service improvement and innovation - to create value for customers.

Kirner et al. (2009) suggest an in-depth analysis of the factors that contribute to innovation and the results of innovation, establishing a relationship between them. It is also possible to carry out an analysis differentiating low, medium and high technology companies, comparing the innovation processes between these profiles. Examining the service delivery process can assist in determining service performance, as Tidd and Hull (2006) suggest.

Another possibility is to deepen the relationship between the implementation of service innovations based on information technology and the performance of organizations (Ordanini & Rubera, 2010), and the development of international comparative studies on innovation in knowledge-intensive companies (Ferreira et al., 2013).

We hope that these suggestions, gathered from the analyzed articles, open horizons for the production of relevant studies on the subject and assist the development of the field.

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## STUDY OF THE PREFERENCES OF TOURISTS THROUGH CONJOINT ANALYSIS: THE CASE OF CEUTA

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*Tourism is one of the world's economic sectors that is growing. According to the World Tourism Organization, tourism activities generate around 9% of the world's GDP and is credited with one of every 11 jobs worldwide (UNWTO, 2015). In Spain, the importance of tourism is even greater (Exceltur, 2016). To develop a tourist destination, analysis and study of customer behavior will allow us to better meet needs and thus build loyalty with destination. In this sense, a predictive analysis can be useful. This work intends to apply the technique of conjoint analysis to determine the preferences of Moroccan tourists visiting the Autonomous City of Ceuta.*

**Keywords:** *Conjoint analysis, Tourist destination, Consumer preferences, Ceuta, Morocco*

### 1. Introduction

Tourism is one of the world's fastest growing economic sectors. According to the World Tourism Organization (UNWTO), tourist activities generate around 9% of the world's GDP, generating one in every 11 jobs worldwide (UNWTO, 2015). In the case of Spain, the importance of tourism is even greater (Exceltur, 2016). Thus, in 2015 the results of tourism activities contributed € 124 billion to the Spanish economy, and was the sector that grew the most in that year, and the one that generated the most employment (one in seven jobs created in Spain in 2015 corresponded to the tourism sector).

Although Spain is positioned in a privileged position in regard to the reception of foreign tourists, the increase in competition worldwide makes it necessary to carry out studies that analyze the preferences of tourists and shed light on the decision-making processes when choosing a specific tourist destination. In this sense, conjoint analysis is one of the preferred methodologies when it comes to clarifying how buyers make choices when faced with alternative products or services (Green, Krieger & Win, 2001). In the case of tourism, several studies have applied this technique in different countries and activities (e.g., Tripathi & Siddiqui, 2010; Thyne, Lawson & Todd, 2006; Dellaert, Borgers & Timmermans, 1995; Picón & Varela, 2000; Ramos, Ramos & Ramos, 2004).

In the case of the development of a tourist destination, the analysis and study of the behavior of the clients will allow us to better satisfy their needs and thus retain them with the destination. In this sense, conjoint analysis is a predictive technique that can be very useful

The basis of conjoint analysis is the assumption that the consumers of a product or service make a purchase or decision while considering simultaneously all the characteristics of the product or service. In contrast to other traditional methods in which consumers evaluate all the characteristics of a product as important in making a decision, in this technique the discards that are between the characteristics are analyzed, because in this way a better indicator of the importance is provided relative to one another.

Several studies have used this technique to analyze the preferences of tourists who come to a destination. This is the case of Ramos *et al.* (2004) who use this technique to study a mature tourist destination such as Tenerife; or Reig and Coenders (2002) who study the preferences and environmental perceptions of tourists who visit the Costa Brava. In a more methodological work carried out by Picón and Varela (2000), an interesting conceptual and empirical comparison is made of four of the market segmentation methods with conjoint analysis that are most used in applied contexts, all executed on the Galician tourist market. Conjoint analysis has also been used in other contexts. For example, Syadi *et al.* (2004) analyze the externalities produced by agricultural activity, using this technique to determine the preferences of customers with respect to the landscape configuration produced by agricultural activities.

The objective of this work is to apply the techniques of conjoint analysis to determine the preferences of Moroccan tourists who visit the Autonomous City of Ceuta, contributing in this way to conform the tourist offer of a city that is immersed in a process of change in its economic model induced to a large extent by Morocco's tariff disarmament process.

## 2. Background

Ceuta is a Spanish (formerly Portuguese) and European city, but located in North Africa and bordering Morocco. It scarcely has natural resources and its land area is very small (18.5 km<sup>2</sup>), which causes it to have one of the highest population densities in the country (4,050 Hab./km<sup>2</sup>). Its economic model based on its consideration of free port is in crisis. Morocco's tariff dismantling, which ended in 2012, has not yet had significant effects on the decline in imports of products, although it is expected in the medium term. That is why many have put their hopes into the tourism sector. In the Ceutí economy, the extraordinary importance of the services sector, and within it the non-market services sector, stands out. Both represent more than 80% of the local gross value added (GVA). It also highlights the high level of unemployment (22.4% in 2016).

An estimate of exports to Morocco by the Tarajal border puts them at 688 million euros in 2014, representing 68.14% of total imports from the peninsula, although there is a general decline in imports of products to Ceuta from 2012, the year the Moroccan tariff dismantling was completed. Regarding the evolution of tourism in Ceuta from 1981 to 2016, there are differences in behaviors between the tourists coming to this city and to other areas of the Spanish coast, because in contrast to what happens in those areas, tourists visiting Ceuta do not seek sun and beaches. This leads us to the conclusion that the alternatives of development of the sector also have to be different. Additionally, if they are also intended to be durable and beneficial to the environment, they must be carried out in accordance with the latest international initiatives on sustainable tourism.

### 3. Methodology

Conjoint analysis is a multivariate statistical dependency technique in which researchers first construct a set of real products or services by combining the selected levels of each attribute that are presented to the respondents to give their global evaluations (Pérez, 2011). The phases that we have used to apply conjoint analysis are following.

#### 3.1. Problem statement

In our case, following a consensus with professionals from the Ceuta tourism sector and with the municipal company “Servicios Turísticos de Ceuta,” we selected six factors or variables considered to be the most interesting for Moroccan visitors: commerce, accommodation, leisure, services, security, and languages. These variables, known as factors or attributes in research, represent the main reasons for traveling and staying in Ceuta. For each variable several levels are defined, which are different options that can make it more or less attractive for the potential tourist. Therefore, according with the municipal officials, each of these factors or variables have been divided into four levels (Table 1).

**Table 1: Variables and levels considered in the analysis**

Commerce	Accommodation	Leisure	Quality Services	Security	Languages
Clearly offers information	Halal Products	Guided tour Ceuta	Good signage	More surveillance	Arab
Kindness in the deal	Free WI-FI connection	Coastal Boat ride	Information services	Friendly police	French
Opening at noon	Breakfast included in price	Kayak Activities	Prices of car parking's	Concern about thefts	Spanish
Opening weekends	Hairdressing and beauty services	Children's parks	Agility at the border	Concern about fines	English

#### 3.2. Generation of an orthogonal design

If we combine each of the four levels of each variable with the levels of the others, we would have a total of 4,096 possible alternatives. The conjoint analysis technique uses a small subset of possible combinations so that it is as representative as possible and achieves the balance of factors and levels. That is, a plan of main effects is generated that is called *orthogonal design*. The result was 25 profiles, each composed of a level of each of the six variables or factors. These are the profiles that were rated from 1 to 100 by the respondents that are contained in question 20 of the survey that is included as an annex and whose statistical treatment we offer in the results section.

### 3.3. Data collection

A survey was designed with two different parts. The first was related to certain socio-economic data of participants (questions 1 to 19). The second one contained the 25 level profiles of the chosen variables discussed above (question 20). To determine sample size, it was taken into account that the size of the population is, in principle, unknown. From a large population ( $N \rightarrow \infty$ ), for a confidence level of 95% and a sampling error of 5%, the sample size would be set at 384 individuals (Santos, 1999, 89). However, given that local authorities indicated that the target population could be around 5,000 to 6,000 visitors per year, it was decided to set a sample of at least 500 individuals. This would survey around 10% of the target population. This strategy reinforces the representativeness of the amount that was technically considered sufficient. As also the target population was located mainly in hotels and large areas, we would be faced with a non-probabilistic type of sampling called "sampling applying criterion," or the type also called "intentional sampling." Finally, 514 valid surveys were obtained.

### 3.4. Conjoint analysis and interpretation of results

Consistency and adequacy of the model is verified using the values of Pearson's  $r$  and Kendall's tau statistics. The Pearson's  $r$  and Kendall's tau statistics are correlations between observed and estimated preferences, and high values indicate that a model fits well with the data. In addition, utility scores should be analyzed for each factor level (levels of the different variables). The total utility of each profile would be a combination of different level of utilities.

## 4. Results

### 4.1. Descriptive analysis

The age of people who visited Ceuta ranges from 30 to 50 years old. According to the distribution by sex, 50.3% of the visitors were men, and the remaining 49.7% were women. In addition, they had income higher than the national salary average. In regard to the region of origin, 72% came from the cities of Tangier, Tétouan, Rabat, and Marrakech, in that order of importance. On the other hand, it was observed that 38.6% returned on the same day to Morocco, and the rest spent time in hotels or hostels in the city for several days. Regarding the reasons that justify their visits to Ceuta, they emphasized the commercial aspects, followed by opportunities for leisure. Finally, 91% of the people surveyed expressed their willingness to return to the city.

The survey included information on the opinion of visitors regarding Ceuta as a tourist destination. They emphasized its image of a safe city, followed by the modernity, the varied commercial offerings, and aspects related to history and heritage, even to a greater extent than the gastronomy or the leisure offerings. In the same way, they valued respect for the environment (globally, people surveyed gave an overall rating of 4.03 out of 5 to the city). It is also important to emphasize that, in general, people who visited Ceuta on more than one occasion gave a higher rating than those who visit

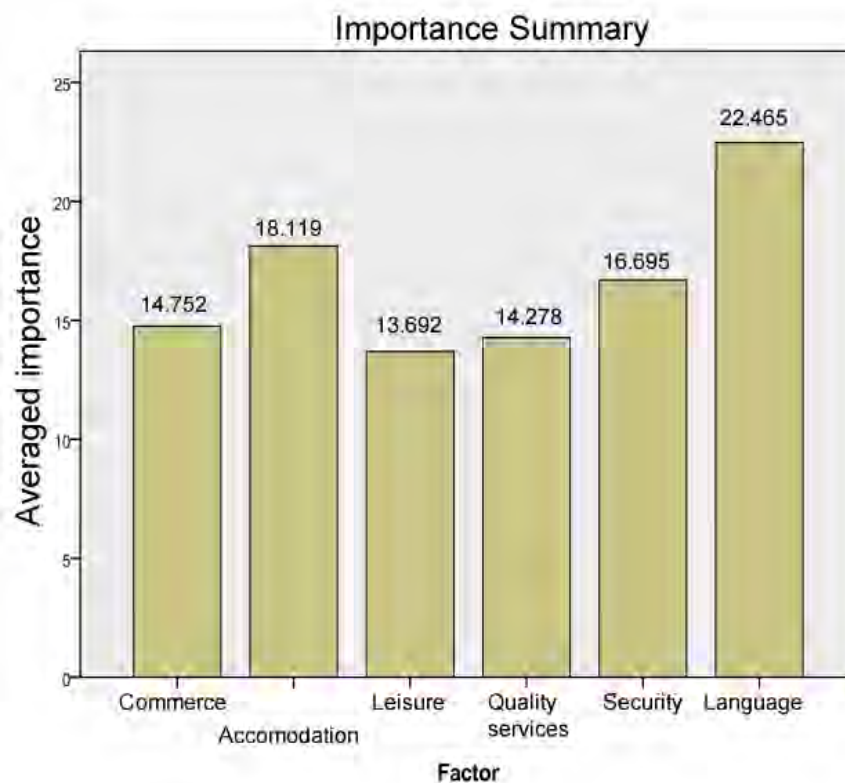
for the first time. However, it is concerning that 65.7% of visitors stated that in Morocco they did not find information on Ceuta's tourist offerings.

## 4.2. Conjoint analysis results

As indicated previously, the second part of the survey included questions to analyze the preferences of Moroccan tourists who visit Ceuta. Commerce, accommodation, leisure, services, security, and languages were considered basic variables, dividing each variable into different levels (see Table 1). Available information was analyzed through the technique of conjoint analysis that obtained an indicator of the relative importance of the different variables compared with the others. The software utilized was SPSS.

First, our results show that the model fits the data. In this sense, Pearson's  $r$ -value was 0.932 ( $p = .000$ ), and Kendall's tau 0.747 ( $p = 0.000$ ). As for the relative importance of each of the factors considered, as shown in Figure 1, language and accommodation were the most valued. The least valued factors were leisure and quality of services.

Fig. 1: Importance for each factor in the analysis.



The optimal combination obtained, in order of importance of the factors, was: (1) French language; (2) Free Wi-Fi in the accommodation; (3) Kindness among police treatment regarding security; (4) Opening on weekends for the conditions of commerce; (5) Agility at the border for types of services; and (6) Boat rides along the coast in leisure activities (see Table 2). This combination scored 85.563 out of 100.

**Table 2: Utilities**

		Utility	
		Estimate	Std. Error
Accommodation	Halal products	.295	.504
	Free Wi-Fi connection	3.626	.624
	Breakfast included in price	-.198	.624
	Hairdressing and beauty service	-3.723	.624
Leisure	Guided tour of Ceuta	-.187	.504
	Coastal boat ride	.165	.624
	Kayak activities	.133	.624
	Children's parks	-.111	.624
Commerce	Clearly offers information	-.392	.504
	Kindness in the deal	-.087	.624
	Opening at noon	-.604	.624
	Opening weekends	1.083	.624
Services	Good signage	-.164	.504
	Information services	-.170	.624
	Prices for car parking	-.661	.624
	Border agility	.995	.624
Security	More surveillance	1.399	.504
	Friendly police	3.692	.624
	Concern about thefts	-2.763	.624
	Concern about fines	-2.328	.624
Languages	Arab	2.995	.504
	French	3.161	.624
	Spanish	-1.628	.624
	English	-4.528	.624
(Constant)		72,841	.412

Based on the above results—and without prejudice to the fact that it may be of interest to estimate the profits of a particular respondent or a group of them, grouped by place of origin, sex, or any other characteristic—the model indicates to us at a general level that the Moroccan tourist who visits us is a person with customs very similar to the West, far from preset stereotypes that were erroneously blamed on our Moroccan neighbors.

Thus, with regard to general preferences, according to the group of variables considered more likely to interest them, we observe that like any tourist anywhere in the world, the first thing that concerns them is the language in which they communicate

with the people who will attend them. Then, they are interested in the conditions of the accommodations to which they will attend and also aspects related to their security. Having resolved these three aspects, the following factors (in order of importance) are those related to commerce, the extra services that are offered to them, and leisure activities. That is, they not only come to buy. They also come to stay in our hotels and to enjoy our leisure activities.

Of all the previous aspects, the only one that does not depend only on the local authorities would be the agility at the border. In this case it is clear that a combined action of local and national authorities would be required to achieve this. However, the rest of the issues depend directly on the Autonomous City of Ceuta, or on commercial establishments.

## 5. Conclusions

The results of this study show a vision of the Moroccan tourist that moves away from existing stereotypes. It is a tourist whose preferences are similar to those of any tourist from Western countries. Thus, with regard to general preferences, according to the group of variables considered more likely to interest them, we observe that like any tourist anywhere in the world, the first thing that concerns them is the language in which they communicate with the people who will attend them. Then, they are interested in the conditions of the accommodations to which they will use and also aspects related to citizen security. Having resolved these three aspects, the following factors (in order of importance) are those related to the local commerce, the extra services that are offered to them, and leisure activities. That is, they not only come to buy. They also come to stay in our hotels and to enjoy our leisure activities.

If we take into account the specific aspects of each of the factors, that is to say, in the levels of care that were established for each of them, we find that they obtain a positive utility score in French and Arabic languages; free Wi-Fi and halal products (with a score close to zero) in the case of accommodations; kindness in the treatment by police and greater vigilance in the case of citizen security; the opening of shops on the weekend; agility at the border; and coastal boat trips and kayak activities.

Of all the previous aspects, the only one that does not depend only on the local authorities would be the agility at the border. In this case it is clear that a combined action by the local and national authorities would be required to achieve this. However, the rest of the questions depend directly on the Autonomous City of Ceuta, or on hotel establishments in the case of free Wi-Fi.

It is worth highlighting the interest shown by these visitors for the opening of shops on the weekend, which shows that they also come to Ceuta to buy. The great brands that have been established in Ceuta (Corte Inglés, Zara, Lidel, etc.), have understood this from the beginning. The rest of the establishments have in their hands the mechanisms offered by the collective bargaining agreement of Ceuta, which in its article 9 establishes a series of compensations for those workers or staff who provide their services on weekends. That is, we would be facing an important niche market, as these visitors have shown a clear interest in making their purchases on those days.



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# THE DIGITAL SERVICITIZATION OF MANUFACTURING: A LITERATURE REVIEW AND RESEARCH AGENDA

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*The convergence of services and digital technologies is generating unprecedented opportunities in manufacturing, by adding value to products, allowing more efficient processes, and supporting improved managerial decisions with richer, faster and sounder information. Yet, despite its high relevance, there is still a lack of scientific knowledge regarding this phenomenon. We analyse the merging trends of manufacturing digitization and servitization with the main purpose to describe and explain if and how the evolving technological landscape facilitates, habitates and supports manufacturing servitization. More specifically this paper aims to put the current knowledge on the topic into order. We present a systematic review of the scientific literature concerning how digital technologies enable servitization in manufacturing, as the first step of a research programme on how these two megatrends are jointly disrupting resources, competences, skills and consequently business models. We show that the knowledge about how digital technologies support service transformation in manufacturing is still at an early stage and rather limited. Then, key challenges and future research directions within this topic are highlighted.*

**Keywords:** digital servitization; digitization; manufacturing firms; literature review; research process

## 1. Introduction

Recent advances in information and communication technology (ICT) have led to a proliferation of new services and have changed how customers interact with companies before, during and after purchasing. On the other side, it has also radically modified in many respects how services are delivered to and experienced by customers (Ostrom, 2015). According to Rust and Huang (2014), fast evolving digital technologies present opportunities for developing customized value propositions, with higher quality services and deeper customer relationships. In particular, the adoption of digital technologies has recently been identified as crucial for manufacturers moving to product-service system business models (Adrodegari and Sacconi, 2017; Ardolino et al., 2017). The transition of manufacturing firms “from (physical) products to (immaterial) services” has been addressed by a growing amount of scientific literature (Lightfoot et al., 2013; Luoto, Brax and Kohtamäki, 2017; Baines et al., 2017) and defined among others as ‘servitization’ (Vandermerwe and Rada, 1988), ‘product-service systems (PSS)’ (Tukker, 2004), ‘moving towards solutions’ (Windahl and Lakemond,

2010); however, this growing body of knowledge has failed to sufficiently consider the role of technologies in servitization (Grubic and Jennions, 2017).

Following this standpoint, this paper provides a first attempt to narrow this gap by investigating the role of digital technologies in the manufacturing firms' transition "from products to services". In order to achieve this goal, we conducted a systematic literature review so to identify, collect and systematize the available scientific contributions on how digital technologies enable servitization in manufacturing companies, identifying directions for future research.

This paper is structured as follows: section 2 provides a brief description of the research's background and setting, reports the objectives and describes the research field. In section 3, the used methodology is outlined. A descriptive evaluation of the body of the literature is followed by a content analysis in section 4 and section 5 draws the final conclusions and directions for future research.

## **2. Background**

### **2.1. Servitization in manufacturing**

In the current global economy, manufacturers are under pressure to adapt to an ever changing business environment. In response to these drivers, new trends have emerged such as the servitization of manufacturing (Wise and Baumgartner, 1999). Generally, examples of leading practice in the adoption of servitization are focused on larger companies supplying high-value capital equipment such as Alstom, ABB, Caterpillar, Tales and Rolls-Royce. These famous cases show how also traditionally product-centric companies have successfully moved from "products to services" (Baines, 2008).

Servitization refers to the transformation in which manufacturers are increasingly offering services that are directly coupled to their products (Baines and Lightfoot, 2014). Since the late 1980s (Vandermerwe and Rada, 1988), its adoption as a competitive manufacturing strategy has been studied by many authors, who have specifically sought to understand the development and implications of this concept. Current servitization literature points to a number of opportunities for manufacturers: it is considered a strategic alternative to product innovation (Carlborg, Kindström and Kowalkowski, 2013) and standardization (Baines et al., 2007); it represents a way to differentiate the offerings to meet increasingly more heterogeneous needs (Baines and Lightfoot, 2013) and to create additional value adding capabilities for traditional manufacturers (Baines, 2008). Moreover, the commercial benefits of servitization are considered convincing (Neely 2009); the environmental arguments (significant reductions in materials and energy usage) are compelling; and the opportunities immense (Royal Society, 2009). However, the risk of failure in the transition is indeed high for companies, both for internal reasons as well as for market ones (Gebauer et al., 2005; Neely, 2009) Thus, it is not surprising that there is still a growing interest in this topic not only in academia but also in business and government.

Over the years, the concept of servitization was treated in different ways among research groups. More specifically, the related literature could be grouped into three main streams, based on the existing terminology which describes this phenomenon. The difference arises in the motivation and geographical origin of the research communities. Servitization was first captured in the work of Vandermerwe and Rada in

1988, who focus on the role of services in sustaining the competitiveness of manufacturers (Lightfoot, Baines and Smart, 2013). This first research stream emphasizes the evolutionary process of (manufacturing) companies that progressively add services to their product offer and sustain their competitiveness (Lightfoot et al., 2013; Eloranta and Turunen, 2015), moving along the so-called product-service continuum (Oliva and Kallenberg, 2003). This process is enabled by the development and delivery of a portfolio of services. Service innovation is, therefore, seen as a critical aspect in the servitization process of product-centric firms (Kindström and Kowalkowski, 2014). The second stream adopts the terms Product Service System, (PSS), Integrated Product Service System (IPSS) or Industrial Product Service System (IPS2) and is a Scandinavian concept. A Product-Service System is defined as “a system of products, services, supporting networks and infrastructure that is designed to: be competitive, satisfy customer needs and have a lower environmental impact than traditional business models” (Mont, 2002). The PSS research stream emphasizes the objective of reducing the lifecycle impacts of products and services and therefore increasing their sustainability. The third stream derives from the system selling literature and uses the terms Solutions or Integrated solutions, “innovative combinations of products and services leading to high-value unified responses to customers’ business and operational needs” (Davies, Brady and Hobday, 2006). This stream is characterized by a customer centric-view: it emphasizes the role of customers in the development process of integrated solutions, and the management of customer relationships (Frankenberger, Weiblen and Gassmann, 2013).

How to make the move from products to services and successfully overcome the challenges of the transformation process is an issue addressed by all research streams, which, despite the diversity in naming, define this transformation as an inevitable strategy.

## 2.2. Digitization in manufacturing

According to Accenture Technology Visions 2014 (Daugherty et al.), digitization is a new layer of connected intelligence that augments the actions of individuals and organizations, automates processes, transforms data, and incorporates digitally empowered systems into our lives, increasing our insight into and control over the tangible world. Digitization has already shown to have tremendous impacts, significantly changing societal and organizational behaviours and structures (Newell and Marabelli, 2015; Orlikowski and Scott, 2014). Particularly, it has great impact on how firms do business and causes rapid shifts in the strategic environment (Constantiou and Kallinikos, 2015; McAfee and Brynjolfsson, 2012). This rapid shift brings new meaning to the competitive position of companies, where temporary advantages are developed as opposed to sustained competitive advantages (Kriz, Voola and Yuksel, 2014). Furthermore, on-going dynamics in the competitive environment caused by digitization is disrupting existing value-chains and business models, thus redistributing profits in these markets. Today some of the most profitable enterprises are applying strategies and business models which would not have been possible without the latest ICT developments (Altman and Tushman, 2017; Orlikowski and Scott, 2014). These have allowed for better ways to satisfy customer needs and have redistributed profits to firms who have challenged the very basics of their industry (Binns, Harreld, O'Reilly and Tushman, 2014). Over the last decade, IT innovations including big data, analytics, cloud manufacturing, Internet of Things, additive manufacturing and others, have increasingly made our world more interconnected and complex.

More specifically, the digital technologies in which this research focuses on are:

- Internet of Things (IoT): is the Internet of the future, a global network in which billions of devices can be heterogeneously interconnected to exchange data and interact to extend their functions beyond the physical world and reach common goals without direct human intervention (Li, Da Xu, and Zhao 2015; Evans and Annunziata 2012; Atzori, Iera and Morabito 2010).
- Cloud computing: allows ubiquitous access to a shared pool of computing resources – such as servers, storages and operating systems – that can be convenient, configured and provisioned on-demand, with minimal management effort (Mell and Grance 2010; Arockiam, Monikandan and Parthasarathy 2011).
- Predictive analytics: is the application of skills, expertise and algorithms on collected data to estimate the likelihood an event will take place in the future (Ogunleye 2014).
- Additive manufacturing, also referred to as 3D-Printing, is a fabrication technique involving the progressive deposition of material onto a substrate, layer by layer. Such a technology enables the creation of high-complexity parts, and thus it is widely employed in economic sectors that either require personalised goods or geometry-driven performances (Conner, et al., 2014).
- Big data: is used to describe the collection of large and potentially complex data sets containing both structured and unstructured data into commonly accessible data sets. Big data has the potential to aggregate a large number of transactional or task-oriented data sets into a single ubiquitous access point where behavioral and statistical analysis techniques can be applied to uncover new behavioural patterns and market segments (Demirkan et al. 2015).
- Cyber security: brings a broad variety of connectivity advantages (Colombo et al., 2014) and risks with them. The security principle of need-to-connect between different secure cells or between components of the production network and outbound devices is quite often disregarded.
- Other technologies: we insert in this category, technologies that are still little discussed in literature such as platforms and smart networks.

Among the others, these new digital technologies are radically changing the way services can be delivered and scholars agree that their adoption is crucial for manufacturers to move towards more service-based business models (Ostrom et al., 2010; Ardolino et al., 2017). Yet, although, previous studies show consensus on the relevance of digital technologies in the journey to service business, a comprehensive view is still missing.

### **2.3. Digital servitization**

Academics and business practitioners agree that technology has been a major driving force behind the progress of today's service world (Rust and Huang, 2014). The "digital servitization" thus is a new layer of connected intelligence that automates processes, transforms data, and augments the actions of the organizations enabling companies to provide PSS. In fact, ICTs are integral to a growing number of services (Chae et al., 2014) so that it has been said that "the service revolution and the information revolution are two sides of the same coin" (Rust et al., 2014). In their shift to a service business, manufacturers introduce digital technologies to increase the effi-

ciency of service delivery and to raise the value of their new PSS offerings (Adrodegari et al., 2017). A representative example is the service of free-floating car sharing of “car2go” – an attractive alternative to a self-owned car, which was recently introduced in the market but sees a rapid growth (Schulte and Voss, 2015). Moreover, by endowing products with awareness, intelligent interfaces and connectivity, provision of advanced services can be enabled (Lightfoot et al., 2013): for instance by connecting products to a (remote) control room, manufacturers can provide services such as predictive maintenance (Allmendinger and Lombreglia, 2005). As far as billions of field data are collected, manufacturers can develop information and knowledge about how, when and where their products are used by whom, which problems occur in time and why, etc. (Opresnik and Taisch, 2015). The installed base management for instance contributes very accurate data and provides deep insights to the organisation so to fulfil the increased customer requirements, e.g. reaction times, incident prevention and machine availability (Neff et al., 2014). In turn, firms can leverage on this data bonanza to develop fully new business opportunities (Porter and Heppelmann, 2014, Evans and Annunziata, 2012; Rijdsdijk, 2007). Despite the general agreement that the use of digital technologies speeds up manufacturing companies’ servitization process, enables novel product-service offerings (Lerch and Gotsch, 2015) and generally reshapes the industry competition (Porter and Heppelmann, 2014), little attention has been set until now on how the above is achieved. In fact, the two research domains of manufacturing’s servitization and digitization have somewhat been developed in isolation and only recently the synergies between the two have been recognized. Only recently, in fact, have authors started to identify and analyse business cases which combine servitization and some specific technology such as remote monitoring (Grubic, 2014; Grubic and Peppard, 2015; Wuenderlich et al., 2015), IoT (Zancul et al., 2016; Georgakopoulos and Jayaraman, 2016; Rymaszewska et al., 2017, etc.), cloud computing (Wen and Zhou, 2016; Weinman, 2016; etc.), big data (Demirkan et al., 2015; Opresnik and Taisch, 2015; Ostrom et al., 2015, etc.) and predictive analytics (Belvedere et al., 2013; Ardolino et al., 2017).

However, this is a relatively new and under-investigated stream of research, with only a handful of significant contributions focusing only on one explicit digital technology at a time, rather than to the conundrum of all the relevant technologies. Thus, there is the need for a more focused research in order to systematize the existing knowledge of this field (Ardolino et al., 2017; Grubic and Jennions, 2017). Consistently, as illustrates in Figure 1, this paper aims to investigate the “digital servitization” phenomenon in manufacturing.

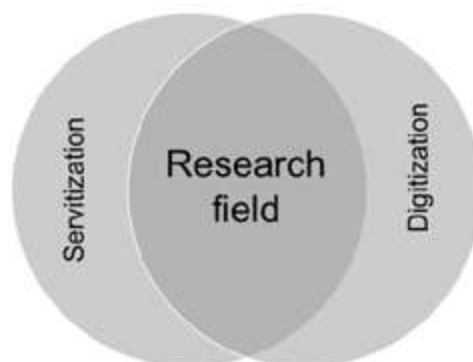


Fig. 1: Research space: digital servitization

### 3. Methodology

To advance our understanding of servitization's and digitization's trend intersection, this study consisted of a systematic literature review. It is noted that until now the main used methodology over the topic was based on use cases and a classification is missing. According to Cook et al. (1997), a systematic literature review is a replicable process that has as a result to develop collective insights based on theoretical synthesis of existing studies and to get more reliable results and not draw conclusions. A structured keyword search was designed and conducted in the Scopus (www.scopus.com) database, one of the largest multidisciplinary abstract and citation databases of peer-reviewed literature (Geraldi et al. 2011) including major and minor publishers like Elsevier, Emerald, Springer, and Wiley. Our literature review encompassed English-speaking peer-reviewed papers covering the 16-year-period from 2000 to 2017. In order to ensure that only quality publications were included, all the conference articles, commentaries, book review articles and lecture notes were excluded (Seuring and Muller, 2008). The keywords used in the search were divided in two categories, the first one related to services which includes: "servitization", "product-service system (PSS/IPSS)", "integrated solutions", "smart services", "service transformation", "service infusion", "integrated solutions", and the second one associated with technologies: "digitization", "emerging technologies", "ICT", "big data", "remote control", "remote monitoring systems", "emerging technologies", "digital manufacturing", "digital technologies", "Industry 4.0". All the possible combinations between these two categories were scanned and the selected contributions were refined following the process presented in Figure 2 below.

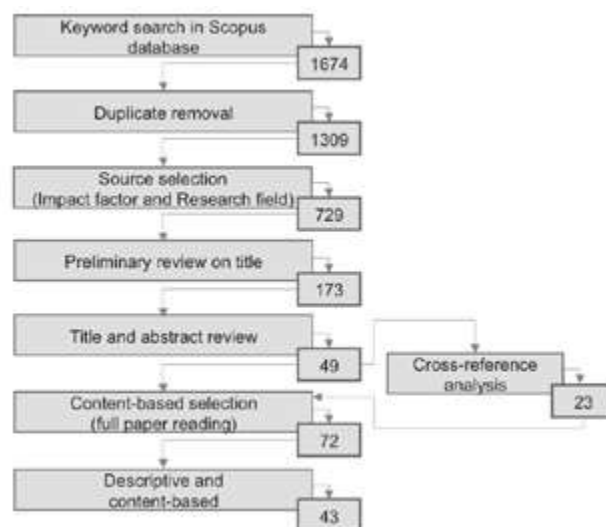


Fig. 2: Systematic literature review procedure

The search yielded 1.309 articles excluding the duplicates and papers with no author. All the basic information, like title, author, year, journal, keywords, authors, were exported to an Excel file for further analysis. From the selected sample, only the papers (729) that appeared on journals with a high impact factor according to InCites Journal Citation Report and related to the field of operations, technology, services, manufacturing, business, life science and marketing were selected (173). The next step was to scrutinize them by reading the title and abstract which lead to 49 papers. In this way, we figured out which followed the thematic screening criteria:



1. The paper addresses the servitization topic or similar streams like product-service systems, servitization and integrated solutions in the manufacturing;
2. The paper addresses the adoption of digital technologies in general or specifically Internet of Things, big data, predictive analytics, remote control, additive manufacturing, cloud computing and cyber security.

In the last step, all 43 articles that met the inclusion criteria were read in detail and analysed. Simultaneously, a cross-reference analysis completed the database search in order to overcome possible limitations of the database or keyword search which led to 72 papers in total. From these, under a detailed content-based analysis, 43 were finally selected as they were considered completely on target. All articles were coded in terms of: name of authors, title, published date, journal, method, stream, technologies, perspective, results, conclusions and future research. In the next section we describe the basic findings of the literature review based on these 43 papers.

## 4. Findings

### 4.1. Descriptive analysis

This following section describes the basic features of the papers considered by our study. Figure 3 reports the temporal distribution of the 43 analysed papers. The papers are distributed along 13 years from 2005 to the first quarter of 2017. The first paper was published in 2005 (Allmendinger and Lombreglia) but a long gap follows until 2010 (Van Den Heuvel and Papazoglou). Then a 5 papers peak is reached in 2011, highlighting the emergence of the “digital servitization” research stream. After 2012, the same time in which the concept of “Industry 4.0” was first mentioned in Germany, the amount of publications issued on digital servitization increased steadily reaching in 2016 the number of fourteen studies. This growth is an evidence to the increased interest in the world of scientific research on the subject. So, our review’s objective is to rationalize and organize the existing knowledge and identify subsequent research areas.

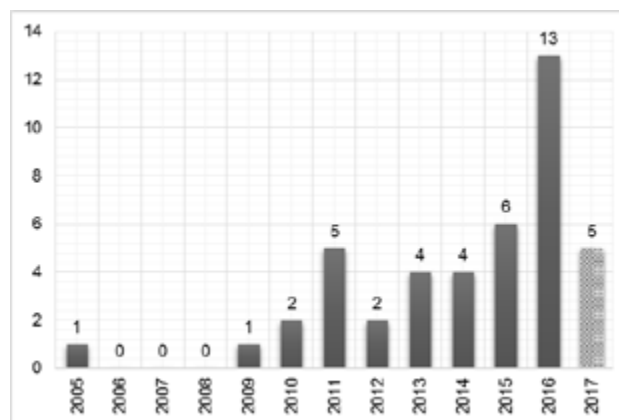


Fig. 3: Distribution of publication over year

Analyzing the distribution of these publications by keyword, Figure 4 shows that the majority of the authors used the PSS’s definition, followed by servitization. The above could be connected with the study sectors (section 5.2). Nowadays, innovation is one

of the most important goals of a company’s strategy, stressing out its direct connection with “digital servitization” which changes radically the structure of a company. The application of the Internet of Things has a strong presence within the considered papers, followed vigorously by cloud and remote monitoring. Interesting is the presence of “business models” which reinforces the need of change within the structure and way of working in an organization.

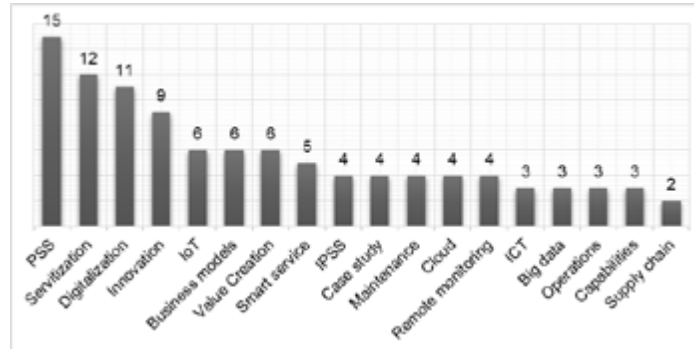


Fig. 4: Distribution of publications by keyword

The total number of the unique journals in which all the papers are published is also investigated. Table 1 reports the journal distribution, indicating a concentration on just 9 journals that published more than half of the papers (58%), while the remain of scrutinized papers (18 papers or 42% of the total) were published in 18 journals. The smooth journal frequency distribution further shows that this is an emerging research topic in its early stage of publishing, and being approached from such a wide variety of disciplines, as: operations management; information technology and computer science; marketing and strategy. Moreover, it can be noticed that the majority of the considered journals has a relatively high impact factor which strengthens this research stream’s quality and added value.

Journal	No. of papers	Percentage	Impact factor
International Journal of Production Economics	4	9%	3.49
Journal of Manufacturing Technology Management	4	9%	1.75
Computers in Industry	3	6%	2.69
IFAC-PapersOnLine	3	7%	0.90
International Journal of Production Research	3	7%	2.32
Communications of the Association for Information Systems	2	5%	1.47
Industrial Marketing Management	2	5%	3.16
International Journal of Advanced Manufacturing Technology	2	5%	2.20
Service Business	2	5%	1.81
Others	18	42%	-

Table 1: Distribution of the selected publications by journal

In addition, we categorized these journals according to their Scopus Subject Area. Figure 5 shows the number of papers per Scopus subject macro area. More papers relate to Business, Management and Accounting and Engineering might suggest that “digital servitization” research gets more attention from a business than from an environmental perspective. This result is surprising, in the face of the close relationship between PSS (see section 2.1) and sustainability (Mont, 2002a.; Tukker, 2013).

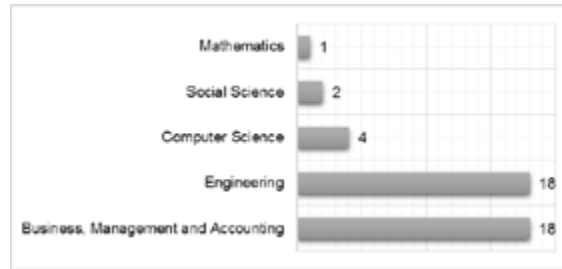


Fig. 5: Distribution of selected papers per Scopus subject area

Another investigated aspect concerns the papers' geographical distribution, presented in Figure 6. It is observed that the "digital servitization" seems to be mainly a European phenomenon: the UK, Sweden and Germany, with a general tradition in services and servitization, seem to dominate in terms of number of publications (Neely, 2103). In particular, Luleå University of Technology (Sweden), Aston University (UK), and Cranfield University (UK) have each two publications as publishing institutions. We noted also that the contribution of the USA, surprisingly, is modest whereas in other research fields in management is much more present (Demirkan, 2015).

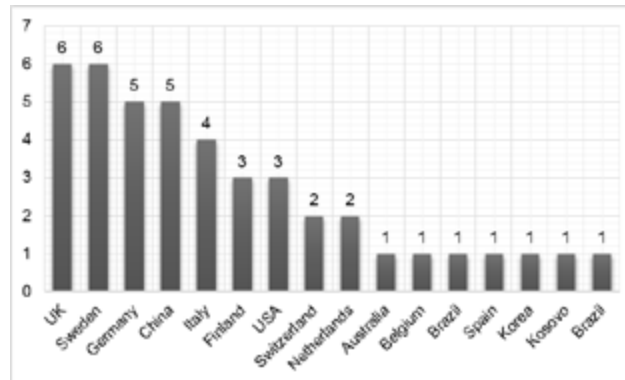


Fig. 6: Publications by country of origin of the publishing institution

Another important element for the descriptive analysis is the number of citations obtained by each paper. Table 2 lists the 8 papers (19%) that obtain the 80% of the total citations and can be considered as the most relevant. by number of citations. It is apparent that the most cited papers - apart from those that were published some time ago and could therefore accumulate citations over time.

Year	Author	Document title	Citations
2005	Allmendinger G., Lombreglia R.	Four strategies for the age of smart services	97
2011	Meier H. et al.	Industrial Product-Service Systems (IPS2): Paradigm shift by mutually determined products and services	93
2009	Candell O. et al.	eMaintenance - Information logistics for maintenance support	85
2015	Ostrom A.L. et al.	Service Research Priorities in a Rapidly Changing Context	71
2014	Tongur S., Engwall M.	The business model dilemma of technology shifts	68
2012	Zhu H. et al.	A Web-based product service system for aerospace maintenance, repair and overhaul services	52
2011	Huang G.Q. et al.	RFID-enabled gateway product service system for collaborative manufacturing alliances	35
2016	Cenamora et al.	Adopting a platform approach in servitization: Leveraging the value of digitalization	33

Table 2: Top 8 papers by number of citations

It is remarked that the most cited papers in the list were in 2011 and 2012 when the interest about “digital servitization” started-off (Huang et al., 2011; Baines et al., 2011, Zhu et al., 2012) coming up with the first exploratory research results. Surprisingly, though, because of its recentness, the third most cited paper is that of Ostrom et al. (2015) which identifies that the most important research priorities (like transformative service or measuring and optimizing service performance) are in particular urgent for advancing the service field along with big data, which has the largest gap between importance and scientific knowledge. Figure 7 visualizes the correlation between the journals’ impact factor and the citations achieved by papers over time. For this reason, papers with no citations were excluded.

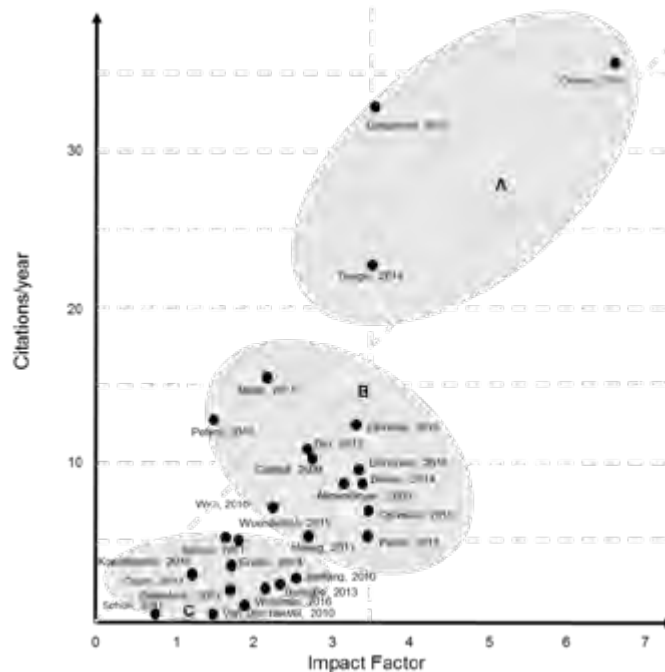


Fig. 7: Correlation of papers’ citations per year vs. journals’ impact factor

Papers in area A (Ostrom (2015), Cenamora (2016) and Tongur (2014)) were published in top ranking journals, and consistently achieved a considerable number of citations in time: for these reasons, we can consider them to be of a particularly good quality and correspondence from scholars. Area B encompasses studies with a lower number of citations, published by journals with an intermediate impact factor, but still with a fair level of interest (Baines, 2014; Eloranta, 2016). In contrast, area C includes studies that should be considered less significant for the academic community (Schuh, 2011).

## 4.2. Content-based analysis

In order to analyse if there is a dominant stream in the “digital servitization” field, the papers have been grouped according to the three main streams presented in Section 2.1. The PSS gets the greater attention with 44% of the selected papers, Servitization 33% and Solutions 23%. As witnessed in the literature review (Song, 2017), the PSS is emerging rapidly due to various research efforts from different areas (e.g. mechanical engineering, software engineering and management engineering) (Geum et al. (2011), Sakao (2014), Baines (2014), Zancul et al. (2016) Wan et al. (2016) and Eloranta (2016)). Another reason for the popularity of the PSS stream can be related

to the emerging concept of circular economy and manufacturing sustainability (Pardo et al., 2012; Sakao, 2014; Zanetti et al., 2016). The above comes in contrast though, with the Scopus subject area results (see Fig. 5) in which sustainability area does not seem to attract the interest of the researchers, yet.

An important aspect to be evaluated when dealing with an emerging stream of research is the methodological approach used by the authors. Figure 8 provides an overview of the various study types. The results indicate that multi-case studies are the most employed type of study (n=17) followed by single case studies (n=8) while there are only five reviews focused on a specific technology (Teixeira, 2013; Grubic, 2014; etc.), one round table discussion and one interview Delphi study (Bokrantz, 2017). The frequent usage of case study research methodology because it offers a more viable option for studying information-rich cases, as compared to surveys (Yin 2009).

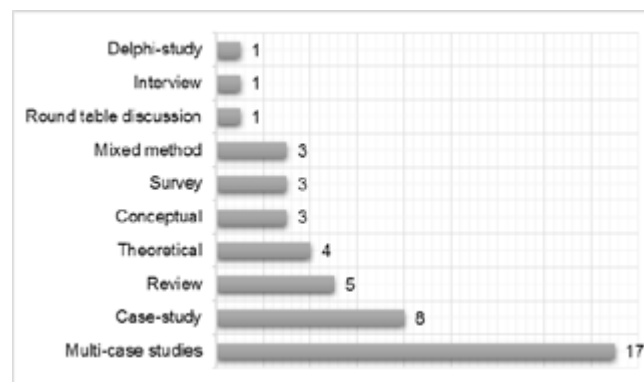


Fig. 8: Study characteristics included articles (n=43)

Table 3 lists some case studies in the most mentioned industrial sectors. Empirical studies often focus on specific industries and address questions such as how the companies adapt their transformation. The predominant industries represented are: machinery, automotive and aerospace, because they contain great potential for improved environmental performance and better use of resources. Specifically, Tongur and Engwall (2014), presented a case study in the automotive industry which contributes to theory by suggesting that managing the „digital servitization“ does not require either technology or service innovation so to create a viable business model but instead a successful combination of them. Another interesting case would be that of “IoT powered servitization of manufacturing-an exploratory case study“. Rymaszewska et al. (2017) selected the particular machinery companies based on their success of their IoT-aided servitization (cloud-based communication between devices and sensors) and the empirical application of them provides insights into different ways of value creation in servitization. The proposed framework aims at providing a better understanding of how companies could achieve the above, by using IoT solutions. Another interesting example is the case study of Zhu et al. (2012) in aerospace which focuses on developing a service ontology to support maintenance, repair and overhaul and create solutions for service providers using the Web-based PSS.

Author	Document title	Study field
Wan S. et al.	Process and knowledge management in a collaborative maintenance planning system for high value machine tools	Machinery
Rymaszewska A. et al.	IoT powered servitization of manufacturing – an exploratory case study	Machinery
Lenka S. et al.	Digitization Capabilities as Enablers of Value Co-Creation in Servitizing Firm	Machinery
Tongur S., Engwall M.	The business model dilemma of technology shifts	Automotive

Juehling E. et al.	Integration of automotive service and technology strategies	Automotive
Zhu H. et al.	A Web-based product service system for aerospace maintenance, repair and overhaul services	Aerospace
Candell O. et al.	eMaintenance—Information logistics for maintenance support	Aerospace

Table 3: Case study examples from the present literature review

Table 4 classifies the papers according to the digital technologies considered and time period.

Internet of Things seems to be the most popular technology among the publications and it supports the development of monitoring services and the gathering of relevant data from the products during their usage. Georgakopoulos, (2016) and Zanzul, (2015) note that one of IoT's adoption opportunities is in servitization, for instance in the machinery industry. It is worth mentioning the discrepancy between the relative low number of papers regarding additive manufacturing and the fact that companies consider it as the most used technology (Zanardini et al., 2016). On the other part, big data, cloud computing and remote monitoring seem to be in a similar position. Big data is obviously connected to IoT and can have an impact on manufacturing enterprises' competitiveness by uncovering opportunities for new service offerings and by capturing and analyzing service-oriented information for real-time decision making (Ostrom, 2015; Opresnik, 2015). Cloud computing can provide access to a remote infrastructure so users are able to run operating systems and applications, have direct access to software applications that don't run on the user's premises and deploy applications that are directly developed in the cloud (Weinman, 2016; Ardolino et al. 2017). Remote monitoring is widely recognized as one of the key enablers of servitization and it is essential that manufacturers deploy remote monitoring of a product's location, condition and use (Ulaga, 2011; Baines, 2014). Papers that do not focus on any of the mentioned technologies (see section 2.2) are classified in the "none" category. In particular, Baines et al. (2013) and Kowalkowski et al. (2013) investigate how information and communication technologies (ICT) as a whole could enable servitization and propose a framework. More specifically, the framework of Baines et al. (2013) illustrates how operations are configured to successfully deliver advanced services and the one of Kowalkowski et al. (2013) helps managers to understand the key specificities and their interrelatedness both for services in support of the product (SSP) and in support of the client's actions (SSC). It has to be noted also that some papers are classified in more than one category because they refer not only to one technology but a number of them (Demirkan et al., 2015; Ardolino et al., 2017; Bokrantz J. et al., 2017). The distribution of the digital technologies over the defined time period stresses the increased trend of research towards the "digital servitization". Since 2011 there has been a sharp increase in research related to Internet of Things, big data, cloud computing, remote monitoring and predictive analytics. It is surprising that only one work was found affiliated to cyber-security technology (Janzen C., 2016) although it receives a high interest from companies these days. Moreover, we noticed that until 2015 there was no specific technology target but new digital technologies in general, in contrary to the late trend which focuses on explicit technologies (Peters C. et al., 2016; Song W., 2017; Ardolino M. et al., 2017), assuming the fact that these technologies are becoming more familiar for the companies.

	2000 - 2005	2006 - 2010	2011 - 2015	2016	2017	Total
<b>Additive manufacturing</b>			Zanetti et al.; Coreynen W. et al.; Peters C. et al.			3
<b>Big data</b>		Demirkan H. et al.; Opresnik D. and Taisch M.; Ostrom A. et al.		Peters C. et al.;	Song W.; Bokrantz J. et al.	6
<b>Cloud computing</b>		Belvedere V. et al.	Weinman J.; Wen X. and Zhou X.		Ardolino M. et al.; Lenka S. et al. Bokrantz J. et al.	6
<b>Cyber security</b>			Jansen C.			1
<b>Internet of Things</b>		Demirkan H. et al.; Wuenderlich N. et al.; Schuh G. et al.		Zancu E. et al.; Georgakopoulos D. and Jayaraman P.; Hajrizi E.; Peters C. et al.; Cenamora J. et al.; Eloranta V. and Turunen T.	Song W. Ardolino M. et al.; Rymaszewska A. et al.	9
<b>Predictive analytics</b>		Belvedere V. et al.; Teixeira E. et al.			Ardolino M. et al.; Lenka S. et al.; Bokrantz J. et al.	5
<b>Remote monitoring</b>			Grubic T.; Wuenderlich N.	Grubic T. and Peppard J.		4
<b>None</b>	Allmendinger G. and Lombreglia R.	Candell O. et al.; Van Den Heuvel W. and Papazoglou M.P.; Juehling E. et al.; Candell O. et al.	Baines T. et al.; Baines T. and Lightfoot H.; Kowalkowski C. et al.; Valencia A. et al.; Hernández Pardo R.J.; Geum Y. et al.; Cáceres R. and Guzmán J.; Meier H. et al.; Durugbo C.; Zhu H. et al.; Tongur S. and Engwall M.; T. Sakao et al.; Huang G.Q. et al.	Wan S. et al.;		19
<b>Total</b>	1	4	24	15	12	66

Table 4: Classification of papers based on the used digital technology over years.

## 5. Conclusions

The role of digital technologies in the process of manufacturing firms' servitization is still under-investigated (Akaka and Vargo, 2014): that is why it is the topic of this paper. More specifically, this study was driven by the need of acquiring and systematizing the current scientific knowledge on what we define as "digital servitization". First, by performing a structured literature analysis, we selected a sample of 43 papers specifically focused on this topic. Next, we analysed the quantitative and qualitative characteristics of the collected sample of papers in order to define the intellectual territory of the digital servitization research field and to identify possible knowledge gaps in order to further develop the existing body of knowledge.

Despite its importance, our literature review shows that only recently researchers started addressing the "digital servitization": thus, this research field can be still considered in its early stage. During the last 5 years, though, the "digital servitization" has gained a considerable importance in the academic arena, testifying the increasing scientific attention on this topic. Given its young age, this field can therefore represent a great opportunity for future research with the aim to better define and understand the link between the digital and servitization transformation, and even to develop a contingency model that can support and guide academics and practitioners alike.

We also identified that this increasing research focus is particularly concentrated on the business and engineering perspectives, and comes particularly from Europe. Hence, academics from other countries worldwide might focus as well their research on digital servitization in order to create a greater diversity, which will lead to increased value. This a second direction for the development of this research field.

Coherently with the fact that this research stream is still in its early stage, among the selected papers we also recognized a lack of contributions focused on systemizing the current knowledge. This paper therefore represents a first attempt to put in order the widespread body of knowledge and to avoid the risk of fragmentation of research developments, aiming to facilitate a common understanding of the phenomenon also outside the research community. In particular, we suggest that future research on "digital servitization" should make more reference to the existing literature, compare new findings with previous ones, and achieve a harmonization of the terminology.

Moreover, by studying the selected papers, we found that researchers of this field used overwhelmingly the case studies methodology to analyze the "digital servitization", while we found very few theory building contributions. While case studies may be very important in order to align academia and industry, we find necessary to stimulate more effort to develop and propose conceptual and theoretical works. In other words a real digital servitization theory has still to come. We remind that theory can also be built through well-designed surveys that have also the advantage of achieving a possible generalization of the results

A final empirical finding of our research refers to different technologies addressed by the scrutinized papers. IoT, big data and cloud computing were found to be the most popular among digital servitization researchers, which in turn could suggest that other less investigated technologies could be considered by authors less supportive to develop new service-based offerings. In particular, we underline that additive manufacturing, which is extremely used by companies (Zanardini, 2016), does not seem to be as attractive for academics in research studies.



We underlined the need to develop new business models in order to facilitate “digital servitization” (Wünderlich, 2015; Ostrom, 2015). Moreover, the understanding and acquisition of vital competences, experience and knowledge is crucial for the implementation of the different digital technologies (Cenamora et al., 2016; Ardolino et al., 2017). Finally, a more efficient use of the resources and the need of a description and explanation of the required dynamic resource configurations for digitally enabled servitization (Belvedere et al., 2011; Coreynen, et al., 2016). Thus, potential future research could also focus on an in-depth and systematic analysis of the existing knowledge in the emerging topic of digital competences within organizations, which was significantly mentioned as a future research challenge in 17 papers.

The research avenues we presented above are suggestive and certainly not complete. Yet a set of contributions are being opened by this study which could support scholars and practitioners alike to better understand the challenging developments that are taking place. In conclusion, it can be highlighted that the implementation of digital technologies in order to facilitate servitization remains an important yet understudied area of research. While the systemization of the literature on “digital servitization” makes some significant contributions to this emerging research field, this paper is mostly exploratory in nature and should be seen as a starting, rather than arrival, point. Our next step will be firstly to develop a “digital servitization framework” that will show in detail which and how digital technologies change the services offered by manufacturing firms.

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# THE HEALTHCARE PATHWAY MANAGEMENT IN ORGANISATIONS ACTING AS INTERFACES BETWEEN THE HOSPITAL AND THE MEDICAL AND SOCIAL AMBULATORY SERVICES

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DICEN IDF (Information and Communication Devices in the Digital Era)

## **Abstract**

*The patient centred approaches and the use of Information and Communication Technologies (ICT) reveal an evolution in the practice of coordination in organisations acting as interfaces between the hospital and the ambulatory medical and social services.*

*In the healthcare pathways, the patient centred approach implies to manage the coordination of a multidisciplinary team, which should deal with all the aspects of the patient care, and to display information, advice, therapeutic education and patient monitoring, aiming at involving the patients in the process.*

*The function of healthcare pathway manager is analysed simultaneously with the part played by ICT in the management of healthcare pathways in order to outline some relevant evolutions and highlight in an overview the main differences in the functions of coordinator in several organisations.*

*We present the content of the existing training programs for those functions, and the methods and tools that are in use in such organisations acting as interfaces between the hospital and the ambulatory actors.*

*This overview clarifies the effects of the setting up of the function in the pathway organisation especially for avoiding splits and for increasing the efficiency of the pathway approach: we outline how the use of appropriate methods and ICT tools can limit the splits in the healthcare pathways and how the digital platforms can help to track individual healthcare pathways and improve the patients' monitoring and to follow efficiency indicators for measuring costs, delays and results for the patients.*

# 1. Introduction

## The Epidemiological Transition

The patients' needs are changing with the epidemiological transition: its main features are the noticeable evolutions in demography and chronicity. Beside acute care structures, the part played by the ambulatory healthcare sector is increasing. In this field, there are many healthcare structures and professionals who practise in different places, even if some of them merge in a common unit.

The average hospital stay durations are shorter, and homecare is often organised in order to anticipate the hospital discharge. Those economical factors have emphasised the part played by the medical and social ambulatory services and made essential to organise the connections between the hospital and all the healthcare actors in the city and on the territory.

## The Ambulatory Medical and Social Services Development

“As healthcare networks expand, the healthcare landscape becomes far more crowded and pluralistic. More resources allow for diversification: the range of specialized services that comes within reach, may include emergency services, specialists, diagnostic infrastructure, dialysis centres, cancer screening, environmental technicians, long-term care institutions, pharmacies, etc.”<sup>1</sup> The figure one below shows especially the extraordinary richness of services specialization.

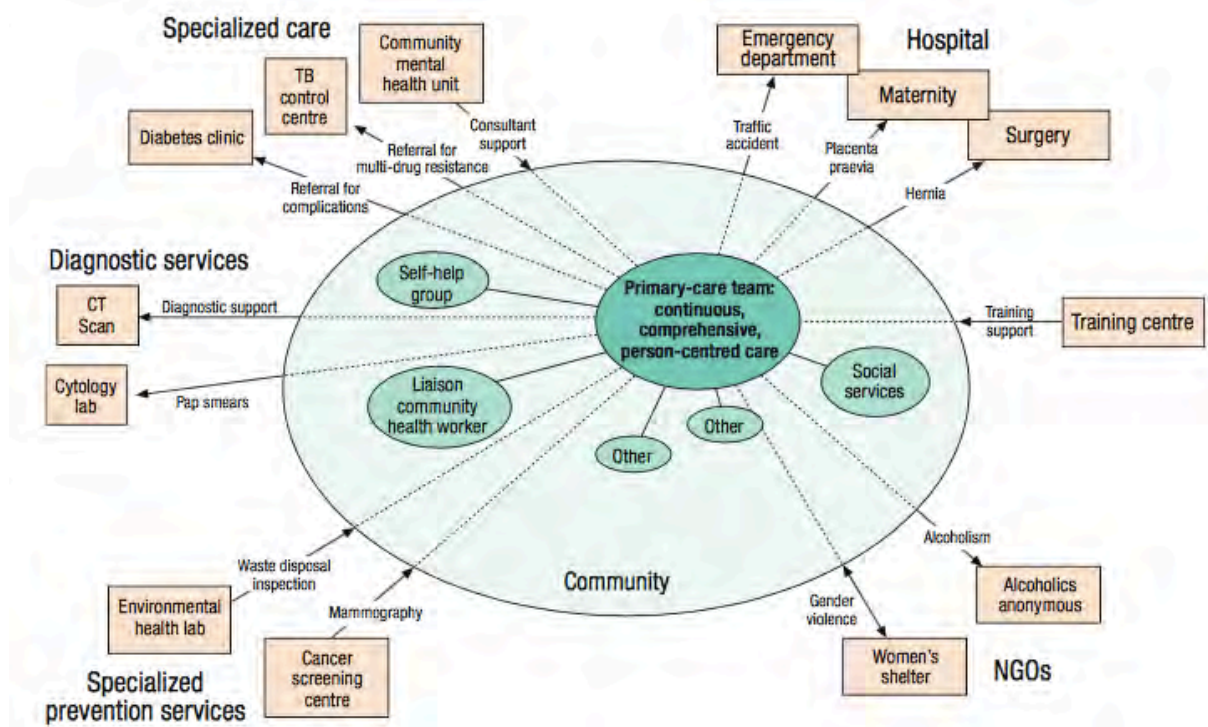


Fig. 1: Primary care as a hub of coordination: networking within the community served and with outside partners<sup>2</sup>

<sup>1</sup>The World Health Report 2008 « Primary Health Care – Now More Than Ever » p.55S

<sup>2</sup>[http://www.who.int/whr/2008/whr08\\_en.pdf](http://www.who.int/whr/2008/whr08_en.pdf) p.55S



Most patients, especially among the elderly, are now affected by multi-pathology situations, and even frailty or difficult social conditions. All those factors have to be considered in providing healthcare and the stakeholders involved in medical and social services are numerous.

The value created by the specialization is based on numerous organisations that are as specialized as the services produced for the patients. The evolution towards specialization establishes a double movement: the autonomy of each specialized organisation and the fragmentation of the field it covers. From the point of view of theories of the organisation, the specialization for efficiency promises has to be approached through reinforcement of coordination at the organisational level (cf. Mintzberg' synthesis, 1979). The coordination in a larger scope than the one of organisation is approached for a long while in the healthcare field with all the literature about the healthcare networks, especially in 2003 with the MiRe report (Bercot et al., 2003).

Orientating several organisations for working together around the patient's healthcare pathway represents a difficult context, especially because there is proliferation of organisations. For Verhoest and al (2007), who work in public management, the coordination is at the core of numerous cases: among them, reinforcing cooperation and collaboration at the level of the service is required in order to fix serious problems in the society; also, the case where strategic and horizontal goals do exist, as opportunities equality, sustainable development, environmental policies, policies in favour of minorities. The priority given to the efficiency of policies rather than to the cost savings and to performance is a factor for the necessary development of the coordination. Those aims can be found through the definition of coordinator. As reminded in the WHO report<sup>3</sup>, "the distinctive features of primary care" are ... "person-centered care, comprehensive and integrated responses, continuity of care, a regular and trusted provider as entry point", and "organizing primary-care networks" require "bringing care closer to the people, responsibility for a well-identified population"...

The coordination is a major issue in the healthcare system. Insisting on the importance of « integrated healthcare pathways », M.-A. Bloch tells the difference between three levels for the integration, enabling to appreciate the work between all the stakeholders in the specific case of MAIA structures : connection, coordination and whole integration (Vayssette et al., 2015). « At the connection level, the stakeholders know what each one of them does on a given territory... The coordination goes beyond the mere exchange of information. The stakeholders work together on coherent actions and shared goals... The level of whole integration is rallied in complex situations with only one manager... » (2015, p. 21). For us, M.-A. Bloch' analysis is too specific to the case of MAIA (Maisons pour l'autonomie et l'intégration des malades Alzheimer). We prefer the concept of cooperation for analyzing every type of interface organisation. The cooperation takes into account the complex situations but the work is co produced without necessarily making operational aims explicit and without only one manager. Sharing the values is enough. M.-A. Bloch considers that the way of the working

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<sup>3</sup>The World Health Report 2008 « Primary Health Care – Now More Than Ever » p.425

together is a way to build from the emergence of new functions and new skills at the service of the patient : in particular case managers or pathway managers. “The healthcare interface organisations represent privileged spaces in innovation for this progressive way from connection to the coordination and to the integration» (Depeyrot-Ficatier, 2017).

## 2. The Case of Coordination in Healthcare Interface Organisations

“Care coordination is a patient- and family-centred, team-based activity designed to assess and meet the needs of patients, while helping them navigate effectively and efficiently through the health care system. Clinical coordination involves determining where to send the patient next (...), what information about the patient is necessary to transfer among health care entities, and how accountability and responsibility is managed among all health care professionals...”<sup>4</sup>

The healthcare ‘ is often considered widely and longer in the perspective of life pathway (“parcours de vie”); in France, after a period of experimentation by territorial pilots, the PAERPA program for the elderly in risk of loss of autonomy (“*Personnes Agées En Risque de Perte d'Autonomie* ») is now generalised. It has been based on the concept of frailty which “...extended beyond its purely clinical dimension makes it possible to envisage implementing a combination of policies (prevention, care pathway, private insurance) either through time or simultaneously, and sufficiently upstream of the process leading to loss of autonomy.” (Vanhaecht, Kæt alii., 2007)

With the first development of territorial hospital communities (“*Communautés Hospitalières de Territoire*” CHT) and more recently with the law for the modernisation of the healthcare system in France in 2016<sup>5</sup>, with the setting up of territorial public hospital groups (“*Groupements Hospitaliers de Territoire*” GHT), the territorial coordination is heightened for hospitals.

In attempts for organising a real continuity in the patients’ following and to provide support to professionals, territorial support platforms: “*Plateformes Territoriales d'Appui* (PTA)” are now set up in France in order to organize support to patients and professionals for complex healthcare pathways.

Including the other stakeholders involved in the healthcare pathways, the territorial platforms providing support to professionals and patients (PTA) arise now for managing the complex cases for patients in difficult health and/or social situations.

### The Management of Personalised Healthcare Pathways

« A care pathway is a complex intervention for the mutual decision making and organisation of care processes for a well-defined group of patients during a well-defined period. (...)

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<sup>4</sup>SCare Coordination Measures Atlas Update Chapter 2. What is Care Coordination? Agency for Healthcare Research and Quality Rockville, MD Content last reviewed June 2014

<sup>5</sup>Lloi de modernisation de notre système de santé : Loi n° 2016-41 du 26 janvier 2016s

The aim of a care pathway is to enhance the quality of care across the continuum by improving risk-adjusted patient outcomes, promoting patient safety, increasing patient satisfaction, and optimizing the use of resources” (Vanhaecht, 2007).

In the healthcare pathways, the patient centred approach implies to manage the coordination of a multidisciplinary team, which should deal with all the aspects of the patient care, and to display information, advice, therapeutic education and patient monitoring, aiming at involving the patients in the process.

More than coordination between the professionals for one type of pathology, a global life approach and the co-construction with the patients are essential features in the healthcare pathway organisation.

- ICT represent a well-known lever for achieving the functions of coordination.
- What is really the situation? ICT are they factors of coordination between specialized organisations around a common goal.
- However, Verhoest (2007) notices the implementation of ICT and electronic administration as factor of need of coordination, although in the consulting approach but also in a large range of scientific literature, ICT seem to be an answer to the need of coordination.
- Do ICT really increase the need of inter organisational coordination? How do ICT act on control mechanisms?

### **3. ICT Tools for Coordination Functions**

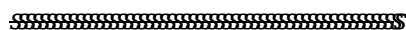
With the requirement of strengthened coordination in the healthcare system, the part played by ICT is increased, at a period when digital healthcare services multiply.

“The role of ICT services in the provision of integrated care (examples):

- Sharing of clinical data across organisations
- Definition of clinical pathways
- Knowledge generation
- Quality assurance
- Framework for data standardisation.”<sup>6</sup>

#### **The Use of Digital in Healthcare Interfaces and the Rise of the Data**

The healthcare interfaces between the hospital and the medical and social services takes four different forms from information sharing with professionals or medical caring services offer, to support provided to professionals or national public offer (Depeyrot-Ficatier et alii, 2016). In other words, it began mainly pushing merely information for raising awareness and broadcasting information for prevention, through guides, workshops, or interactive digital platforms enabling to ask questions.



<sup>6</sup>European Commission, e Health innovation, Scaling up e Health facilitated personalised health services: Developing a European roadmap for sustained e Health Innovation Thematic Network FP7-270986 “Chronic disease management / care integration: lessons learnt “ 2013S

They proposed guidelines for patients, advice for prevention, standardized forms to be filled for professionals, and information through websites.

However, the ones called the healthcare support platforms clearly fulfill the role in coordination among all the actors. The Healthcare Networks facilitated the introduction of local protocols based on research evidence into clinical practice, the more complete and accessible data collection through bases and encourage multidisciplinary communication and changes in practice. They began to structure flowcharts or checklists as means for describing the situations to manage.

In the MAIA model, the interfaces have to run through an even more formalised process, collecting information from databases, analysing the cases and aiming at providing the better orientation for the patients in the territorial area. The medical and social professionals are not part of the MAIA that really takes action as an interface between them.

**The Need to Share Synthetic and Immediate Information in Interfaces**

Through both the development of healthcare digital platforms and the evolution of territorial models as PAERPA and the digital healthcare territory program “Territoire de Soins Numérique” (TSN), a progressive orientation towards a higher of the patients’ or caregivers’ involvement is noticeable.

With the current epidemiologic transition to chronic diseases, patients have to be followed on long-term periods. It will be more and more important to provide them information and support for maintaining a state of health in order to avoid hospitalizations and onerous heavy treatments.

The patients’ healthcare pathways can now be managed through digital means; they require more synthetic and immediate information sharing between all the patients’ care-providers. The stakeholders in the healthcare pathways have to be quickly and briefly informed of new events for having a real reactivity in the following up the individual situations and sometimes for avoiding hospitalisations.

| ICT based integration building blocks                                                                                                                                                                  | Optional components                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) <u>Integrated data access</u> for care providers in different agencies and informal carers                                                                                                          | Integrated Care Record<br>Sharing clinical, scheduling, monitoring information<br>Shared EHR / Access to subsets of EHR<br>Input from health and social care actors / interfaces to different ICT tools<br>Web-based portal<br>Integration of vital sign / health monitoring data into care planning and management processes |
| 2) <u>Design and execution of pre-planned care pathways enabling temporal coordination</u> between provision steps taken by care providers in different agencies, informal carers and cared for people | Workflow engines<br>Charting tools for IC pathways design<br>Joint/shared scheduling, daily schedulers<br>Shared care plans<br>Team coordination support<br>Training delivery/learning pathways/plans for professional and/or patient self-care training support tools                                                        |

Fig. 2: ICT support for care integration and coordination  
Data sharing and coordination<sup>7</sup>



<sup>7</sup>European Commission, eHealth innovation, Scaling up eHealth facilitated personalised health services: Developing a European roadmap for sustained eHealth Innovation Thematic Network FP7-270986 “Chronic disease management / care integration: lessons learnt “ 2013

ICT can provide support especially for better information sharing between the hospitals and the ambulatory healthcare professionals in the application of the 2016 law “Loi de modernisation” for the admission and discharge procedure in hospital stays<sup>8</sup>.

“Use of standardized formats to highlight the most pertinent information improved the perceived quality of documents. (...)

Interventions such as computer-generated summaries and standardized formats may facilitate more timely transfer of pertinent patient information to primary care physicians and make discharge summaries more consistently available during follow-up care.”<sup>9</sup>

### **The ICT Support for the Healthcare Pathway Management**

A 360° vision can be designed for following up the patients’ healthcare pathways and interoperability standards implemented for the information exchanges.

In order to deal with the actions achieved, recommendations have to be stated and spread out and key performance indicators defined.

The different roles have to be configured for the users, and ICT must facilitate data flow and exchange between all the information providers.

Contributing to the patients’ enrolment, ICT helps to create a collaborative environment for exchanging information with them in a 360° vision and defining alerts for a better patients’ monitoring.

ICT has to be used not only to share medical records or individual treatment plans, but also to create clinical risks groups, with patient complexity profiling.

The data bases built now enable to implement support decision tools and to consider predictive modelling and query utilities for selecting patients at risk<sup>10</sup>.

If the coordination functions of the healthcare applications can be found in different solutions, the healthcare support territorial platforms (*“Plateformes territoriales d’appui”*) potentially offer coordination functions through data sharing in a secured environment. But their uses depend on the interface organisations. In the case of the patient’s healthcare pathway, it is fundamental to qualify which is the perimeter of the organisations in question. It includes the concept of healthcare network but goes further because there are organisations which interfere in the patient’s healthcare pathway but do not necessary belong to the patient healthcare network. We agree it is an ecosystem. Although the business ecosystem is well defined within the scope of the strategic analysis and the managerial literature since Moore (1993), we prefer the larger and more coherent definition with the social and medical aims in the field of the patient’s healthcare pathway and which comes from life sciences (and do form the origin of the systemic vision). An ecosystem is characterized by a double linked interaction: interaction between the stakeholders and interaction of those stakeholders with the territory (Tansley, 1935). This choice which is not contradictory with the definition of the business ecosystems of Moore, offers the advantage to go over the mere point of view of the strategic and business analysis and to enlarge the analysis to the interactions between what

8 Décret n° 2016-995 du 20 juillet 2016 relatif aux lettres de liaison

9 “Deficits in Communication and Information Transfer Between Hospital-Based and Primary Care Physicians”  
American Medical Association JAMA, February 28, 2007—Vol 297, No. 8 831

10 ICT Services, ICT Strategy in The Catalan HealthCare and Social Care System - Jordi Martínez CIO  
TicSalut Foundation 15-03-16

we'll name the stakeholders<sup>11</sup> in the sense of Freeman (1984). Consequently, the shareholders and their interactions have to be identified in the precise case of the coordination and ICT.

- In the case of the ecosystem around the patient's healthcare pathway, among all the stakeholders, the interface organisations acting as interfaces between the hospital and the medical and social ambulatory services play a specific role as suggested by the idea of "hub of coordination". They have to aim at avoiding hospitalizations and re-hospitalisations, reducing the hospital stay durations and organise the coordination between so different and numerous services in order to satisfy the patients' needs.

In their organisation as in the use of Information and Communication Technologies (ICT), they have to involve the patients, and not only the professionals, in the healthcare management.

This concept of interface as a hub of coordination meets the one of digital platforms that provide new value creation and empower their users (Van Alstyne et al., 2016).

Their area can be compared to "a distributive computer network model sharing the work across many computers instead of a single large computer" ... as "innovation in technology and treatment combined in a distributive model significantly lessen the need for a hospital" ... with "technology for health information exchange connectivity, EHRs, Google Glass devices, advances in remote monitoring, telemedicine, wearable devices, surgical procedures in an ambulatory setting and pharmaceuticals, etc" ... so «the system is more responsive and moves to the patient needs.»<sup>12</sup> Such «a distributive care network is a disintermediation concept»<sup>13</sup>.

"The concept of interface has two parts.

First, any of the interfaces represent frontiers or boundaries between care providers. As a frontier, the interface may provide an opportunity for the hospital to filter patients and to mediate demand that is considered inappropriate. (...)

The second property of the interface is that it comprises a set of interactions, flows and mechanisms by which patients can move from one level of care to another: a bridge across care boundaries. At the core of this notion is the flow of information (in all its forms)...»<sup>14</sup>

- Which is the coordinator's role? An evolution in the application of the concept of coordination

In a Healthcare Network (*réseau de santé*), the coordinator is in charge of the connections with all the medical and social professionals involved in the patient's caring and monitoring; till now, medical practitioners usually took part of such a Healthcare Network for pathologies requiring specific protocols (diabetes, cancer...) and interactions with other professionals.

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<sup>11</sup> SE Each person or group who can affect or be affected by the achievement of the organisation aims. S

<sup>12</sup> [https://www.linkedin.com/pulse/transformation-healthcare-leading-distributive-krivich-fache-pcm?trk=pulse\\_spock-articles](https://www.linkedin.com/pulse/transformation-healthcare-leading-distributive-krivich-fache-pcm?trk=pulse_spock-articles)

<sup>13</sup> <http://healthcaremarketingmatters.blogspot.fr/2016/04/is-disintermediation-of-hospitals-is.html>

<sup>14</sup> SE Hospitals in a changing Europe » European Observatory on Health Care, Systems Series Edited by M McKee, J Healy Open University Press USA 2002 chap 5

In the homecare hospitalisation model “Hospitalisation à domicile (HAD)”, patients usually come from a hospital stay; in order to ensure the continuity of care, a nurse is responsible for the coordination with the professionals in charge of them in the hospital, and with their general practitioner and nurses for home.

For the optimisation of the hospital stay durations, the French public healthcare insurance organism, “*Caisse Nationale d’Assurance Maladie (CNAM)*”, started up a program called PRADO for accompanying patients in their coming back home after hospitalisation “*Programme d’accompagnement au Retour À Domicile après hospitalisation*».

The basics in the definition of the MAIA (*Maisons pour l’autonomie et l’intégration des malades Alzheimer*) are the principle of case management and the concept of integration. With a change in its appellation: Action method for cure and care services in the autonomy field (« *Méthode d’action pour l’intégration des services d’aide et de soins dans le champ de l’autonomie* »), the MAIA have become a national organisational model. This method brings together all the stakeholders involved in accompanying the elderly in the situation of threatened autonomy. Further than the cooperation and the principle of coordination, the concept of services integration leads to the co-construction of their means of action and their ICT collaborative tools by all the stakeholders, sharing their responsibility.<sup>15</sup>

Does the coordinator add coordination mechanisms following hierarchical mechanisms or insert mechanisms based on information, knowledge and values sharing? How ICT coexist with mechanisms aiming at improving coherence and coordination? How do they reshape them? How do they reconcile the autonomy of the organisations and their dependence in the working together around the patient’s healthcare pathway? Can ICT offer new possibilities in coordination? Do we have to think to new strategies in coordination that could come back to a more integrated specialization for instance through agencies and less outsourced, even privatized?

## 4. Coordination Functions in Interface Organisations

After examining the evolution in the practise of the coordination in healthcare and the ICT potential for understanding the setting up of interface organisations between primary care and hospital sector, we intend to highlight the main differences in the functions of coordinator in those organisations.

### The Coordinator in the Healthcare Networks

A distinction can be made between the coordination of proximity and the coordination for support that the Healthcare Networks should provide (Aubry, 2007).

The French Ministry of Health decided to orientate the Healthcare Networks to the function of back up and support to the coordination. The coordinator’s skills are

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<sup>15</sup> Caisse Nationale Solidarité Autonomie (CNSA) <http://www.cnsa.fr/parcours-de-vie/maia>

stated around three lines:<sup>16</sup>

- Leading, managing and training a collective of stakeholders
- Mastering the ICT tools and process inside the network or the territory
- Implementing methodologies for action, project and evaluation.

### The Case Manager in a MAIA

The MAIA approach defines the different sequences in the function of care manager:

- Receiving and answering to the patients' or the families,
- Collecting and providing information,
- Proposing the orientations for the patients,
- Setting up the individual care programs and social support

The MAIA care managers, coordinated by a pilot, have to take on the analysis of each complex situation, the patient's inclusion, the orientation and the evaluation in order to prepare the individual service plan "Plan de Service Individualisé" (PSI).

### The Healthcare Pathway Manager

In the frame of reference and skills base of the French Ministry of Health<sup>17</sup>, this function is described as following:

- Establishing, organising and managing the connections enabling the optimisation of the care, social and medico social support to a person in the healthcare pathway
- Coordinating the realisation of the multidisciplinary approach for the individual healthcare plan that has been set up.

The function requires both case management and digital skills with the patient centred approach, putting the healthcare system user at the centre of care combined to the extended use of ICT.

The wide perimeter of this function due to a comprehensive approach of healthcare management is illustrated below:

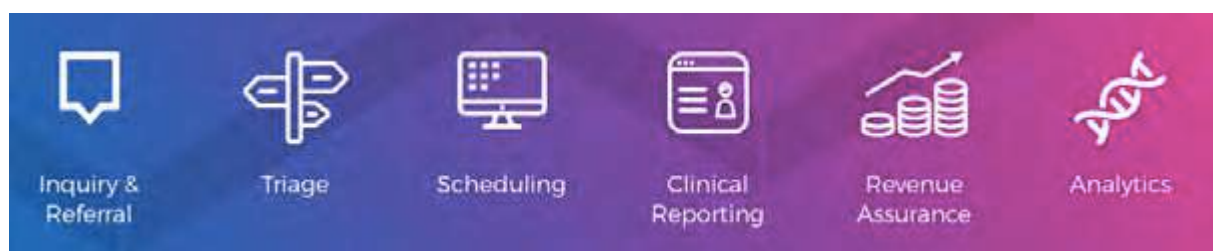


Fig. 3: Stages of Care Pathway Management<sup>18</sup>

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<sup>16</sup> [SS](#) Guide méthodologique « Améliorer la coordination des soins : comment faire évoluer les réseaux de santé » Ministère chargé de la santé Direction Générale de l'Offre de Soins octobre 2012S

<sup>17</sup> [SS](#) Le répertoire des métiers de la santé et de l'autonomie » Fonction publique hospitalière Ministère de la santé et des affaires sociales  
<http://www.metiers-fonctionpubliquehospitaliere.sante.gouv.fr/spip.php?page=fiche-metier&idmet=183>

<sup>18</sup> [SS](https://www.lumeon.com) Source : <https://www.lumeon.com>**A**



## 5. Results with the Healthcare Pathway Management

The coordination is produced by different mechanisms. Usually, a distinction is made between

- Mechanisms based on rules that are enacted beforehand with aims, tasks and responsibility handing out with the creation of direct control and attribution lines,
- Mechanisms relying on inter dependence and mutual confidence as sharing knowledge, values and strategies between stakeholders,
- Or even mechanisms built on market regulations.

We can apply those different mechanisms in order to identify the forms of coordination in the case of the interface organisations.

In the following paragraphs, we make the difference between two configurations of coordination according to four cases of implementations set around the patient's pathway:

- A configuration rested on the mechanisms of coordination of the type of rules, but softened by the mechanisms based on confidence (cases 1 & 2),
- A configuration introducing the market mechanisms as relying on the patient's satisfaction (case 3) and his experience (case 4).

### **Case 1: Avoiding Splits by Sharing Information**

The example of the PAERPA is significant with the definition of specific forms for recording and sharing essential information about patients at the different periods and stages of the healthcare pathway in order to avoid any split.

The healthcare pathways are patients centred, and information has to be followed and shared in order to organise long-term care with protocol management support, phone reminders for patients' observance, etc.

The added value and real breakthrough for the healthcare system with the function of healthcare pathway manager consist mainly in:

- Avoiding splits in the pathway organisation,
- Increasing the efficiency of the pathway approach (quality, costs, delays),
- Tracking the patients' feelings and outcomes,
- Developing secondary prevention,
- Using data analysis.

Some outcomes could be measured, as effects on hospital stay durations and number of re-hospitalization, waiting time between medical appointments, delays for periodic consultations, medicine observance, etc.

### **Case 2: Dealing with Performance Approaches**

The essential goal for the healthcare pathways management is to improve the efficiency of the proposed care and cure plans. ICT tools should enable to track the individual healthcare pathways and to follow the patients' monitoring with indicators such as delays and costs.

These requirements aim at reducing the periods between medical care, avoiding the achievement of redundant medical examinations, preventing the appearance of complications or the occurrence of undesirable events, avoiding splits in the

healthcare pathways and improving the patients quality of life. It is a question of efficiency for the healthcare system.<sup>19</sup>

ICT should now provide data for evaluating the relevance of clinical pathways, detecting time wasting and loss of opportunities by the healthcare pathways management.

Would comparisons between different healthcare pathways be possible in terms of efficiency and performance? What types of indicators could be relevant? Could some reference values be defined?

The French National Authority for Health (Haute Autorité de santé, HAS) makes the difference between indicators for processes and for outcomes.<sup>20</sup>

The National Health System (NHS) has set up guidelines with healthcare pathway schedules: for instance, between the first medical examination by the General Practitioner (GP) and the second one with a medical specialist, there cannot be more than eighteen weeks. In a case of suspicion of a cancer, the consultation with the medical specialist has to be planned within a maximum of fifteen days.<sup>21</sup>

The approach proposed by the French Research and Documentation in Health Economy Institute ("Institut de Recherche et de Documentation en économie de la santé" IRDES) with the Markov chains constitutes a real advance.

In a Markov chain, the state space in the Markov process is discrete, so it can be countable. The analysis is thus based on the mapping and modelling of the healthcare pathway, with the graphic representation and the measurement of the intensities of transitions between different stages in the states of health.<sup>22</sup>

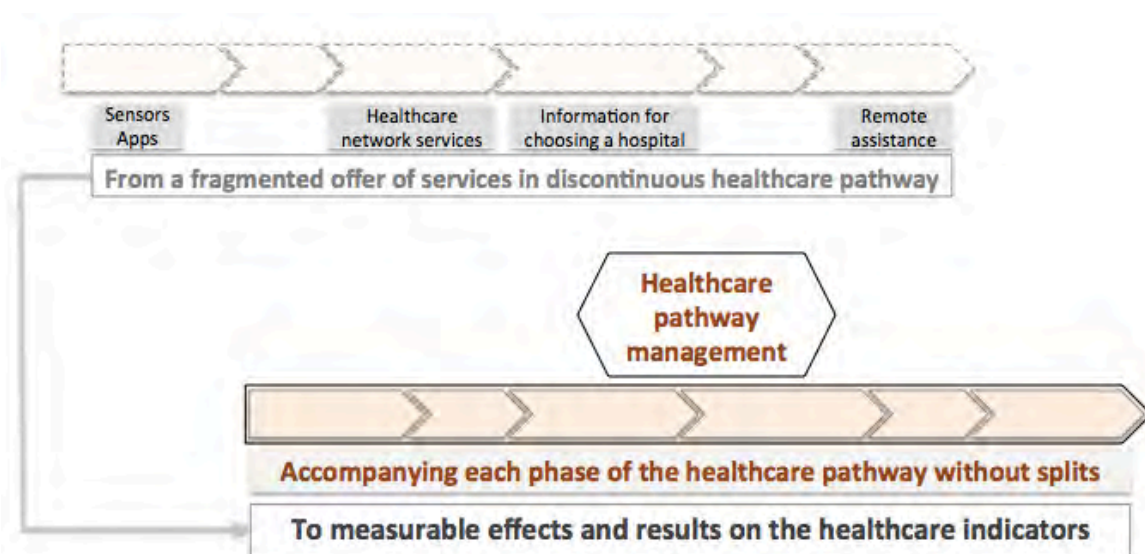


Fig. 4: Effects of care management on the healthcare pathway

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<sup>19</sup> « Innovation et système de santé » Haut Conseil pour l'avenir de l'Assurance Maladie HCAAM - Rapport 2016 Tome 2 p.67

<sup>20</sup> HAS Note de cadrage Programme d'actions communes HAS-ANAP Axe 5 : indicateurs, suivi et évaluation « Développement d'indicateurs de processus et de résultats pour l'amélioration de la qualité et de la sécurité d'éléments clés du parcours du patient en chirurgie ambulatoire », 2014

<sup>21</sup> Sandy Tubeuf, maître de conférence à l'université de Leeds, Royaume-Uni [www.acteurspublics.com/2014/01/27/royaume-uni-le-nhs-le-systeme-de-sante-made-in-uk](http://www.acteurspublics.com/2014/01/27/royaume-uni-le-nhs-le-systeme-de-sante-made-in-uk)

<sup>22</sup> « Utilisation des chaînes de Markov (semi-Markov) pour l'analyse des parcours de soins » Saint Pierre P. (maître de conférence à Paris VI), séminaire IRDES 29 mai 2015

### Case 3: Involving Patients in Evaluation: “*patient traceur*”

The French National Authority for Health (« *Haute Autorité de Santé* » HAS) has defined a new approach for evaluation in healthcare pathways<sup>23</sup>: the approach is based on the concept of tracked patient: “patient traceur” for mapping the pathway.

The approach is a posteriori collective analysis of the global healthcare pathway of a complex patient who agreed for that. It takes into account the patients’ feelings and matches them with the professional’s perceptions in order to evaluate the coordination and the interfaces.

The main characteristic of this approach is to include the patients’ viewpoints combined to the professionals’ ones in order to improve the care and cure services.

It is based on a global approach: care, social and medico-social services, their organisation, the interfaces and the coordination between the hospital and each ambulatory care services and structures.

The questions to the patients are centred on the experience and feelings during the healthcare pathway: understanding the provided information, care continuums, waiting time for medical examinations or appointments for medical specialists, information shared between professionals, diagnosis announcement, well-treatment, monitoring and follow up, pain taking into consideration, useful information handover before or after an hospitalisation, coordination between the stakeholders, etc.

### Case 4: Patients’ Experience and Outcomes Measurements

In the patient-centred approaches in many countries, indicators called PREMS and PROMS have been introduced to measure patient experience and outcomes: the Patient-Reported Experiences Measures (PREMs) and Patient-Reported Outcome Measures (PROMs) could also be required for evaluating the efficiency<sup>24</sup>.

“In order to measure and monitor general patient experience in the health system, the OECD recommends collecting data on patient experience with any doctor in ambulatory settings.” (...) PREMs and PROMs “collect patients’ perception on their specific medical conditions and general health, including mobility, pain/discomfort and anxiety/depression, before and after a specific medical intervention (...).”<sup>25</sup> “Evaluation of healthcare is evolving, with the patient perspective increasingly sought to provide a more patient centred service. Self-report questionnaires are being used to gather information about patients’ health-related quality of life; outcomes with, and experience of a treatment, and perceptions of the care delivered by the healthcare team (...).”<sup>26</sup> Some examples can be considered below:

PREMs

- Time spent waiting
- Access to and ability to navigate services
- Involvement (consumer and carer) in decision-making

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<sup>23</sup> « Démarche d’analyse en équipe du parcours du patient » HAS Guide méthodologique janvier 2016

<sup>24</sup> « Patient-Reported Outcomes (PROs) and Patient-Reported Outcome Measures (PROMs) » T. Weldring, Sheree M.S Smith, Health Serv Insights. 2013; 6: 61–68, 2013 Aug 4. doi: 10.4137/HSI.S11093 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4089835/>

<sup>25</sup> « Health at a Glance 2015 » OECDiLibrary, [http://www.oecd-ilibrary.org/sites/health\\_glance-2015-en/08/15/index.html?itemId=/content/chapter/health\\_glance-2015-58-en&mimeType=text/html](http://www.oecd-ilibrary.org/sites/health_glance-2015-en/08/15/index.html?itemId=/content/chapter/health_glance-2015-58-en&mimeType=text/html)

<sup>26</sup> <http://breathe.ersjournals.com/content/9/5/358.full>

- Knowledge of care plan and pathways
- Quality of communication
- Support to management

#### PROMs

- Quality of life
- Symptoms e.g. pain fatigue
- Distress e.g. depression anxiety
- Functional ability
- Self-reported health status
- Self-efficacy.<sup>27</sup>

## 6. Conclusion

The healthcare interfaces and the function of healthcare pathway manager meet the current needs of patients in the healthcare system with the epidemiologic transition.

Some features underlined for the interfaces between the hospital and the ambulatory sector confirm their positioning to disintermediation;

“What do successful disinter mediators have in common?

- They leverage online technologies to enhance access and use by their customers,
- They relentlessly measure and monitor their own performance to maintain a strong value proposition for their customers.”<sup>28</sup>

The healthcare pathway management contributes to an evolution in the relationships between the patients and the medical professionals, acting for a better patients’ empowerment providing more accurate and personalised information.

The training programs for new functions as healthcare pathway manager should include the actual need to base the development of cooperation on improving the use of ICT.

As findings of this overview, we can picture the interactions produced between the evolution from data collection to information analysis and the way to higher services integration through coordination and cooperation.

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<sup>27</sup> Source: [https://www.aci.health.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0003/253164/Overview-What\\_are\\_PROMs\\_and\\_PREMs.pdf](https://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0003/253164/Overview-What_are_PROMs_and_PREMs.pdf)

<sup>28</sup> “Is Healthcare Ripe for Disintermediation?” Paul Keckley, Ph.D., January 19, 2016 Navigant Healthcare Center for Healthcare research and policy analysis <http://www.navigantrhp.com/is-healthcare-ripe-for-disintermediation/>

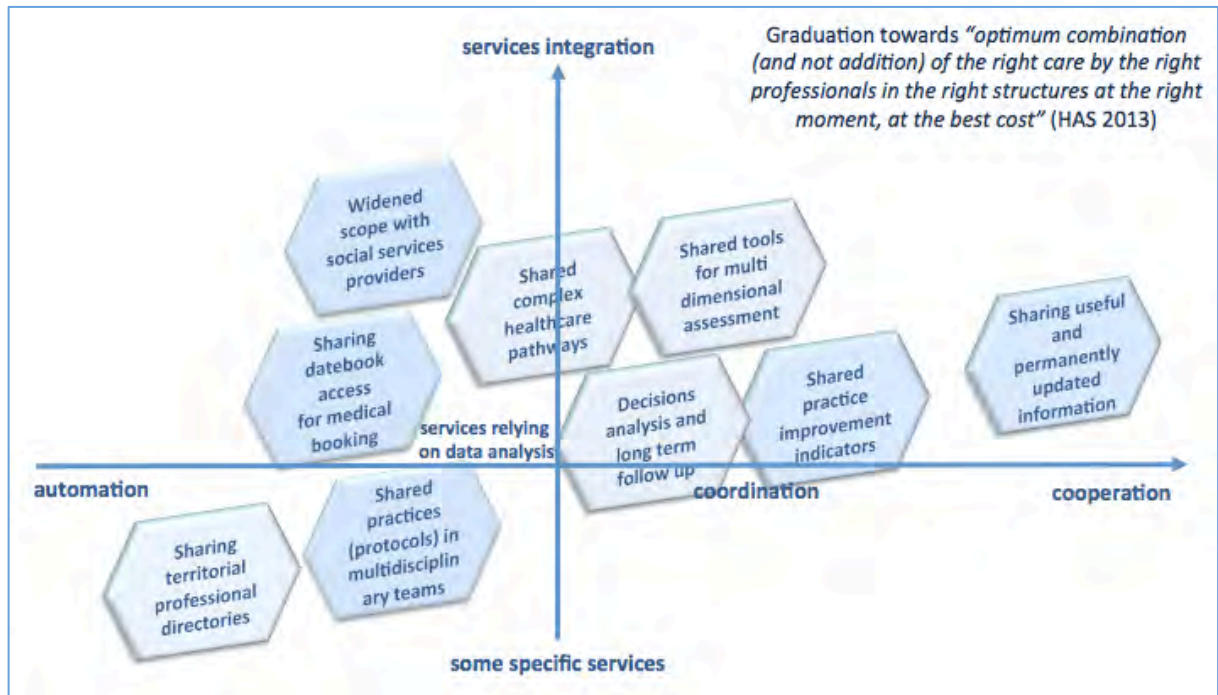


Fig. 5: Draft of the interactions produced by information and cooperation through support platforms

For going further in the analysis of the coordination implemented in the case of the interface organisations, we would have to complete the notion of coordination on the organisational background by an approach of the cooperation in the digital world. Zacklad (2013) offers a useful model for analysing the collaborative work in the digital world with reference to productive, altruistic and inter actionist paradigms:

- The productive perspective considers the whole work as a group of coordinated activities enabling the creation of “objects”;
- The altruistic perspective rests upon “voluntary and free participations”;
- The inter actionist perspective refers to convivial relationships between the stakeholders.

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## THE IMPACT OF CO-CREATION AND SERVICE EXPERIENCE ON THE LOYALTY OF FOOTBALL CLUB SUPPORTERS

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### **Abstract**

Faced with the economic challenges of modern football, a formidable tool that creates dreams and emotions, clubs must create and develop their brand by capitalizing on the loyalty of supporters. Because the link between service experience and sport begin to be a topic more and more common and because co-creation is often set as a promising tool for global industry, we wanted to study the two related concepts with the one of fans loyalty. Thus, the objective of this study is to discover what can be the influence of the experience of service, through different dimensions, and co-creation on the loyalty of supporters of professional football clubs. The results highlight the direct and positive influence of the affective, cognitive, relational and social dimensions of the service experience on the loyalty of supporters. Moreover, co-creation also has a direct and positive influence on the loyalty of supporters, but when the variables of the service experience are introduced, this relationship is no longer significant. The results show that there is an indirect mediation of the affective, cognitive, relational and social dimensions of the service experience between the co-creation process and the loyalty of supporters.



## 1. Introduction

The emergence of professional sport business sector highlighted the importance of a customer-oriented brand management to assure long term performance of the club (Bauer, Sauer & Schmitt, 2005) independently from team sport athletic success (Gladden & Milne, 1999). Sport companies have to be progressive service sellers in order to successfully compete with other leisure offers. Therefore, clubs pay a particular attention into elaboration of a strong marketing strategy in order to deliver a unique experience and increase the loyalty of supporters. According to Desbordes & Richelieu (2013), fans are looking for tangible and intangible benefits that, built end to end, service experience. Schmitt (1999) explains that consumers no longer seek mere products or services, but immersion through experiments. According to Carù & Cova (2006), consumption has become more and more "aesthetic". The customer no longer perceives only the product or service with its gross value but the overall experience gained during consumption. Holbrook and Hirschman (1982) present the act of consumption as a personal and subjective experience in which emotion has its place. In addition, as professional football is an integral part of the entertainment industry, its experiences tend to be more memorable, personal and interactive (Uhrich & Benkenstein, 2010). The service experience is multidimensional. Brakus et al. (2009) suggest that experience is expressed through the sensory, affective, cognitive and behavioral dimensions. Nysveen & Pedersen (2014) proposes that the relational and social dimension can be added to this multidimensional model. Also, these dimensions have open boundaries between them, can be combined and influence each other. Sight, hearing, touch, smell and taste contribute to the theatricalization of the sporting spectacle and affect consciously or unconsciously spectators and supporters in the experience and feelings of their experience (S. Lee, HJ Lee, WJ Seo & C. Green, 2012). The emotional dimension has the capacity to move the supporters by developing a set of positive feelings such as union, joy, excitement, fulfillment, solidarity, fraternity, pride, etc. (Giboreau & Body, 2012). The intellectual dimension mainly helps to reinforce the involvement of the supporter in the club. Tools such as "storytelling" allow clubs to promote the experience offered to their fans (Giboreau & Body, 2012). The relational and social dimension, which is characterized by the quality of the exchanges and the interactions between the brand and the supporters, but also between the supporters themselves, is paramount. The team and the stadium are therefore symbols where emotions are shared and where supporters take root and feel part of a large family (Lee et al., 2012). Behavioral dimension is very important for the clubs because it makes it possible to make concrete the actors by involving them more in the construction and the development of the brand (Giboreau & Body, 2012). Thanks to this, the fans begin to co-create with the club. Thus, consumers are increasingly seen as active collaborators of the brand in the process of innovation. Hienerth & al (2014) speak of an "ecosystem" where a multitude of businesses and consumers interact within a community to innovate. Co-creation has thus become one of the most promising sectors for the development of the real and virtual environment of the consumer and on which professional football clubs can bet (Dijk, Antonides & Schillewaert, 2014). The term co-creation is used by researchers to describe dialogue and interaction, learning, exchange of information and the sharing of resources between the consumer and the service provider. In the present case, between the fan and the football club he supports, consumers are invited to participate actively in the generation and evaluation of ideas for a product or service. Co-creation is not limited to customer involvement in innovation processes over specific periods, but long-term ongoing collaboration (Nysveen & Pedersen, 2014). This is a process from a two-way initiative that creates value for all parties (the client, the brand and other stakeholders). Indeed, co-creation allows to develop a strong and differentiated relationship by involving clients in the conception of the product or service which increases their satisfaction. Therefore, co-creation enhances the buying

intention, the engagement and the loyalty of the clients (Cova et Dalli, 2009). Thus, if the impact of co-creation on customer loyalty has already been identified in the literature, the objective of our research is to identify if co-creation could increase the loyalty of supporters and to understand the mechanism through which service experience can play within this relation. Therefore, our research aims at exploring the influence of service experience and co-creation in the loyalty strategy of supporters of professional football clubs.

## 2. Conceptual framework:

Service experience can bring many benefits to consumers and enable the company to grow by satisfying and retaining customers more effectively. In professional sports, the experience of service is all the more important. Brakus et al. (2009) and Nysveen & Pedersen (2014) suggest that the service experience be composed of sensory, affective, cognitive, behavioral, relational and social dimensions. By setting aside the behavioral dimension we choose to integrate into the co-creation process, we analyze the influence of service experience and sensory, affective, cognitive, and relational and social dimensions on the loyalty of club supporters. Professional football. H1: The experience of service, through its sensorial, affective, cognitive and relational and social dimensions, directly and positively influences the loyalty of supporters of professional football clubs

H1-a: The affective dimension of the service experience directly and positively influences the loyalty of supporters of professional football clubs

H1-b: The sensorial dimension of the service experience directly and positively affects the loyalty of supporters of professional football clubs

H1-c: The cognitive dimension of the service experience directly and positively affects the loyalty of supporters of professional football clubs

H1-d: The relational and social dimension of the service experience directly and positively affects the loyalty of supporters of professional football clubs

In addition, as suggested by Nysveen & Pedersen (2014), co-creation allows customers to personalize their experience and, in general, the company to offer something better suited to what consumers are looking for. Thus, the co-creation process seems to have a direct and positive effect on each of the dimensions of the service experience.

H2: Co-creation has a direct and positive influence on the service experience, through its sensory, affective, cognitive and relational and social dimensions.

Franke & Schreier (2010) explain that co-creation brings personal benefits to customers. Some of these benefits are emotional.

H2-a: Co-creation has a direct and positive influence on the affective dimension of the service experience

At the heart of a football club and mainly within its sports arena, the sensory dimension occupies an important place in the overall experience of the supporter (S. Lee, HJ Lee, WJ Seo & C. Green, 2012).

H2-b: Co-creation has a direct and positive influence on the sensory dimension of the service experience

Also, co-creation requires a long-term collaboration between the brand and its customers. The company must provide sufficient information to clients to encourage them to participate (Dijk & al, 2014). The supporters engaged with their club in this process are thus led to reflect on the brand, its activities and its various products and services.

H2-c: Co-creation has a direct and positive influence on the cognitive dimension of the service experience

Finally, Hienerth et al (2014) define co-creation as a kind of "ecosystem" where a brand and its clients interact within a community in order to innovate.

H2-d: Co-creation has a direct and positive influence on the relational and social dimension of the service experience

Co-creation follows the logic of systemic relational marketing, which aims to set up networks where all the stakeholders are engaged to reflect on the creation of additional value for the brand. The customer is then invited to become a central element of brand development, benefitting both himself and the club. Thus, we analyze the influence of co-creation on the loyalty of supporters of professional football clubs.

H3: Co-creation directly and positively influences the loyalty of supporters of professional football clubs

In conclusion, we will explore through these hypothesis if co-creation leads to supporter loyalty by examining the mediation role of the four dimensions of service experience.

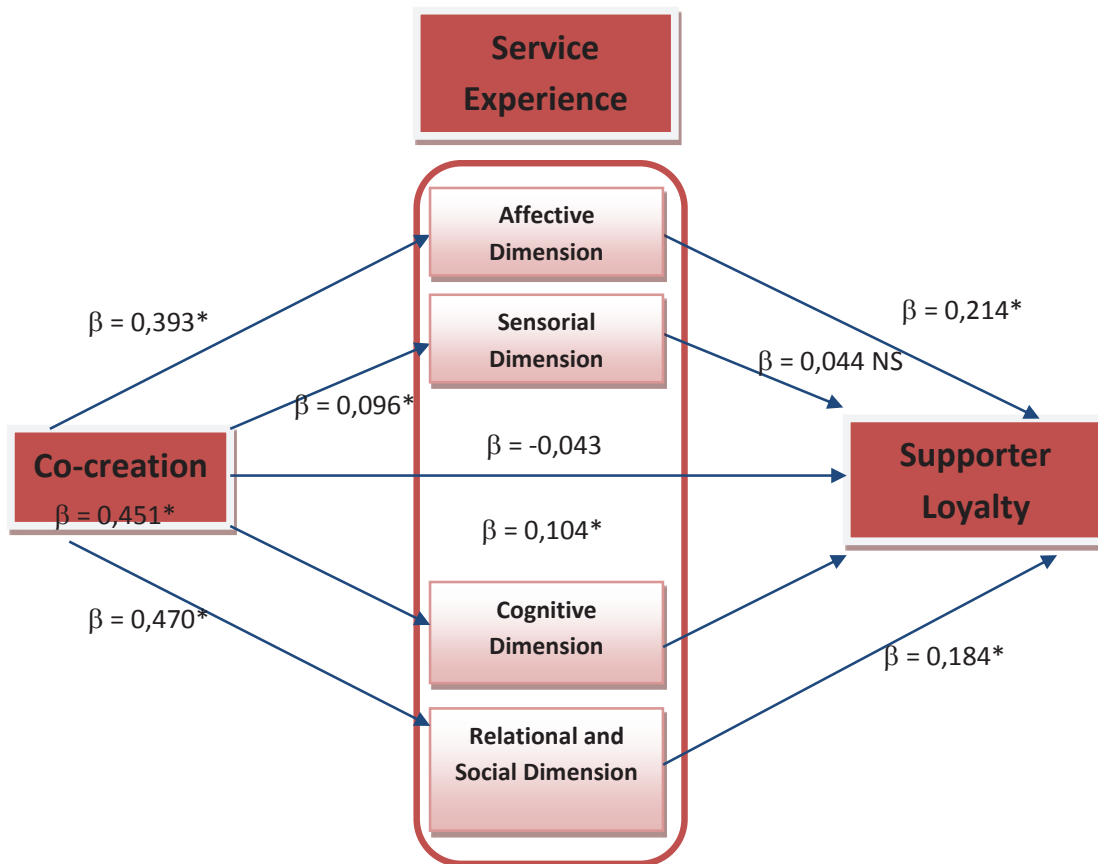
### **3. Methodology**

The causal nature of our research question suggested a quantitative methodology. We designed an online questionnaire with a convenience sample of 584 supporters of one of the 40 French professional football clubs (Ligue 1 and Ligue 2).

Among the respondents, 85% were men and 15% were women and the average age was 27 years. Respondents were asked to express their degree of agreement or disagreement with different statements on a Likert scale ranging from 1 to 7. To measure the key concepts of our study, we used the service experience measure developed by Brakus et al. (2009) that was modified by Nysveen & Pedersen (2014) who also worked on co-creation and finally supporter loyalty was based on Funk and Pastore (2000) and Yoshida et al. (2014), IBM SPSS software allowed us to analyze these responses.

Thus, after conducting factor analyzes to group the items by study design, four items were removed from their study design (one item was removed from the fan loyalty study concept and three items were Removed from the concept of study of the sensory dimension of service experience). Subsequently, we verified the internal reliability of the concepts as a function of the Cronbach Alpha coefficient by ensuring that it is greater than 0.7. All the concepts of our study obtained a satisfactory coefficient. Subsequently, we used a multidimensional mediation test to measure the influence of the co-creation process and the multidimensional service experience on the loyalty of supporters of professional football clubs.

Results



(H1) The results show that the service experience, through its sensory, affective, cognitive and relational and social dimensions, directly and positively influences the loyalty of supporters of professional football clubs

- (H1-a) the affective dimension ( $\beta = 0.214$ ,  $p = 0$ ),
- (H1-c) the cognitive dimension ( $\beta = 0.047$ ,  $p = 0.0005$ ),
- (H1-d) the relational and social dimension ( $\beta = 0.184$ ,  $p = 0$ )

(H1-b) The sensory dimension of the service experience does not play a significant role in the loyalty of supporters of professional football clubs.

(H3) The results show that the relationship between the co-creation process and the loyalty of supporters is positive and significant. However, once the service experience variables are introduced, the path from co-creation to supporters loyalty becomes non-significant ( $\beta = -0.043$ , 95% CI = [-0.0936, +0.009]). Therefore, we have only identified indirect mediation between the co-creation process and the loyalty of supporters.

Co-creation has a positive and indirect effect on the loyalty of fans through the influence of three different dimensions of service experience. These three dimensions of service experience are:

- (H2-a) the affective dimension ( $\beta = 0.084$ , 95% CI = [+ 0.548 + 0.1251]),
- (H2-c) cognitive dimension ( $\beta = 0.047$ , 95% CI = [+0.0187, +0.836]),

- (H2-d) the relational and social dimension ( $\beta = 0.087$ , 95% CI = [+0.0500, +0.1299]).
- (H2-b) The sensory dimension of the service experience does not play a significant mediating role in the relationship between co-creation and supporters' loyalty.
- (H2) Thus, co-creation has a total indirect effect on supporters' loyalty ( $\beta = 0.227$ , 95% CI = [+0.179, +0.274]) across the different dimensions of the service experience cited above.

#### Discussion and Managerial Recommendations

Our study highlights the crucial roles that co-creation and service experience play to increase supporter loyalty. More precisely, our results show that co-creation indirectly and positively influences the loyalty of supporters to their club, alongside the different dimensions of service experience that play a mediating role. We demonstrate the important influence of the multidimensional service experience concept on the loyalty of the fans towards the club and thus go in the direction of the works realized by Brakus et al. (2009) and Nysveen & Pedersen (2014). Our research provides interesting managerial implications for managers of professional French football clubs or, in general, managers of professional sports organizations, in charge of marketing and communication strategy. Since the Bosman ruling and the commodification of sport, French football clubs are lagging behind their European neighbors and are seeing a disengagement of supporters towards them. Fans are the *raison d'être* of clubs. It is important to develop brands with which fans will want to engage more. To develop the customer relationship and retain more effectively, many approaches are possible. We have highlighted two: service experience and the co-creation process. Our results show that club should focus on the emotional, cognitive, relational and social dimensions that are the pillars of the customer experience and play a direct and positive role in the loyalty of supporters. Our results also confirm that co-creation constitutes a valuable tool for club managers who want to enhance loyalty.

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# THE PROCESS OF SERVICE INFUSION IN MANUFACTURING COMPANIES AND THE IMPACT ON CORPORATE STRATEGIES IN THE SERVICE SOLUTIONS MARKET – DRIVING FORCES AND COMPONENTS.

A case study of 'servitization' in the life-cycle of Wind Power Turbines and the development of corporate strategies in the marketing of O&M Services.

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## Abstract

The aim of this paper is to investigate the impact of 'servitization' and 'service infusion' in manufacturing companies (e.g. the wind turbine industry), how it changes the industry's 'product-service systems' (PSS) defined as "a marketable set of products and services capable of jointly fulfilling a user's need" (Goedekoop et al 1999) and why services are increasingly becoming an important part of the business model and innovation process of complex capital goods and products resulting in different corporate strategies for the solutions market. How the manufacturing companies decides to organize ('internally' or 'externally') their offerings in the service solutions market, i.e. choose their corporate strategy regarding the service solutions market is determined by the impact of the specific market, the complexity of their goods and services, use of 'big data', the institutional 'set up' on different geographical markets and their specific customer relations.

*Keywords:* Servitization, Product-Service-Systems, Corporate Strategies, Wind Turbine Industry, Service Solutions Market and O&M (Output & Maintenance) Service Agreements.



## Introduction

'Servitization' as a concept to describe and understand the move of manufacturers from offering capital goods and products to complex solutions containing a large amount of services have been around for a while in the literature (See Kowalkowski, Gebauer, Kamp and Parry 2017 for an 'overview'). It describes how manufacturers of capital goods are increasingly reorienting their value propositions and business model from selling products alone to providing solutions which combines products with services to form customer-specific, high-value solutions. Making this move from products to solutions depends on the development of capabilities that facilitate the integration of products and services, as well as to develop, sell and deliver services (Paiola et al. 2013).

The different views on the shift from products to solutions (e.g. 'servitization', 'service infusion', 'product-service systems' and 'complex service systems) all converge into the concept of 'solutions', which can be defined as "innovative combinations of products and services leading to high-value unified responses to customers' needs" (Davies et al. 2007). Different *service components* are included in the offerings of manufacturing firms that move from products to solutions together with different *corporate strategies* for organizing offering, e.g. by 'selling after-sales services', 'integrating after-sales solutions', 'selling life-cycle solutions' and 'orchestrating total solutions'.

Traditionally, the move starts with adding services supporting the sales of the capital goods and products (e.g. documentation, information). It continues with basic services in the after-sales phase, which ensures the functionality of the product (e.g. diagnosis of failures, spare parts, repair and inspection services). More advanced services may be included, such as maintenance, retrofitting, remote services, monitoring services or process optimization aimed at preventing product failures in the daily operation. These after-sales services guarantee the product functioning throughout its life-cycle. A further step is the provision of services supporting the pre-sales phase: R&D-orientated services, such as design and construction. These pre-sales services respond to the specific business and customer needs, whereas operational services supporting the after-sales phase ensure the functionality of the product and respond to the operational needs of customers.

Continuing the move from products to solutions which further extends services in the customer activities by taking full responsibility for a customer's internal process through business process integration services leading to a kind of 'performance offering', whereby customers pay for the performance reached by the processes rather than for the products and services provided by the supplier (Gebauer et al 2010). The performance offering changes the business and revenue models of the manufacturing company.

Finally, increasing the number and quality of service components included in the solution requires integration services as well (Davies, 2004), i.e. customizing activities ensuring that all product and service components fit together and can be changed according to changes in customer's needs.

To secure the transition from products to solutions a company must develop capabilities to design, sell and deliver services (service capabilities) and to integrate these services into customer-specific solutions (integration capabilities), i.e. create a business model that build on capabilities which deliver value to the customers and secure revenues to the company (Teece et al 1997). The capabilities can be developed either internally (by the company itself) or externally (outsourced to suppliers and partners). The decision of whether capabilities should be developed internally or externally depends on strategic decisions (corporate strategy) by the manufacturing firm regarding becoming either a 'system selling' firm, i.e. choosing a single vendor approach in which all of the capabilities associated by the 'product-service system' are developed internally or a 'system integrating' firm, i.e. choosing a multi-vendor approach buying from external partners and integrating the capabilities for delivering product and service components, or alternatively adopting a mixed approach (Paiola 2013).

The driving forces behind these choices are different depending on the size of the company, the service component investigated and the specific market for the product and services of the manufacturing firm. In this paper, we are focusing on the impact of a specific market, the complexity of capital goods and service offering, use of 'big data', institutional set ups on different geographical markets and specific customer relations.

The formation of corporate strategies can be understood and observed as a strategy development process, which have clear resemblance to what James Quinn (Quinn 1980 and 1989) described as *logical incrementalism* (cf. also Kowalkowski et al. 2012), i.e. the development of strategy by “experimentation and learning from partial commitments rather than through global formulations of total strategies” (Quinn 1980).

In the analysis of the ‘servitization’ of manufacturing firms delivering capital goods and services, we look upon service innovation as a systemic process spanning the whole lifecycle of a given capital good or plant from the stages of design and construction to the full operation and maintenance of the investment. The main purpose of the business is to deliver the optimal ‘value-in-use’ and cost-saving potentials to the customer. Thereby the whole product-service innovation process is reversed, and therefore calls for a more holistic view to the specific product design, because the ‘serviceability’ during the whole operational life of the capital good, product or a complex plant must be considered even during the early stage of the design process.

### **Complex service systems and value networks (‘net chains’)**

Services have an increased share within the manufacturing industry and the role of services in providing value is also becoming ever more important. Therefore, there is an increased interest among manufacturers in adding value through the provision of services that extend the spectrum of their products. Thus ‘services’ extend into every part of the value chain (Mont 2002).

Traditionally, industrial economy places the central value on the exchange of the products that are consumed. The service economy, on the contrary, recognizes the value of utilization, a performance driven orientation where the consumer pays for the use of the product. As such, the service economy can be described as a ‘functional’ economy, in which both product and technology are merely a way of providing ‘functions’. This is because a functional economy “optimizes the use (or function) of goods and services and thus, the management of exiting wealth (goods, knowledge, nature). The economic objective of the functional economy is to create the highest possible use value for the longest possible time while consuming as few material resources and energy as possible” (Stahel 1997). In this functional economy, material

products are treated as capital assets rather than consumables, thus increasing value-added services to prolong product life and minimize loss of functional capacity.

In the literature, this development has been referred to as the ‘servitization’ of manufacturing, a term coined by Vandermerwe & Rada (1988), describing a shift from selling products to selling an integrated combination of products and services that deliver value-in-use for the customer (Baines et al 2007). Closely related to the process of servitization is the term ‘product-service system (PSS), defined as “a marketable set of products and services capable of jointly fulfilling a user’s need (Goedkoop et al 1997). The difference arises in the motivation and geographical origin of the research communities. PSS is a Scandinavian concept, which is closely coupled to the debate on environmental impact and sustainability, but in practice many principles of servitization and PSS are identical (Tukker and Tischner 2006).

Most classifications of product service systems (PSS) make a distinction between three main categories of PSS as shown in Figure 1 (Tukker 2004):

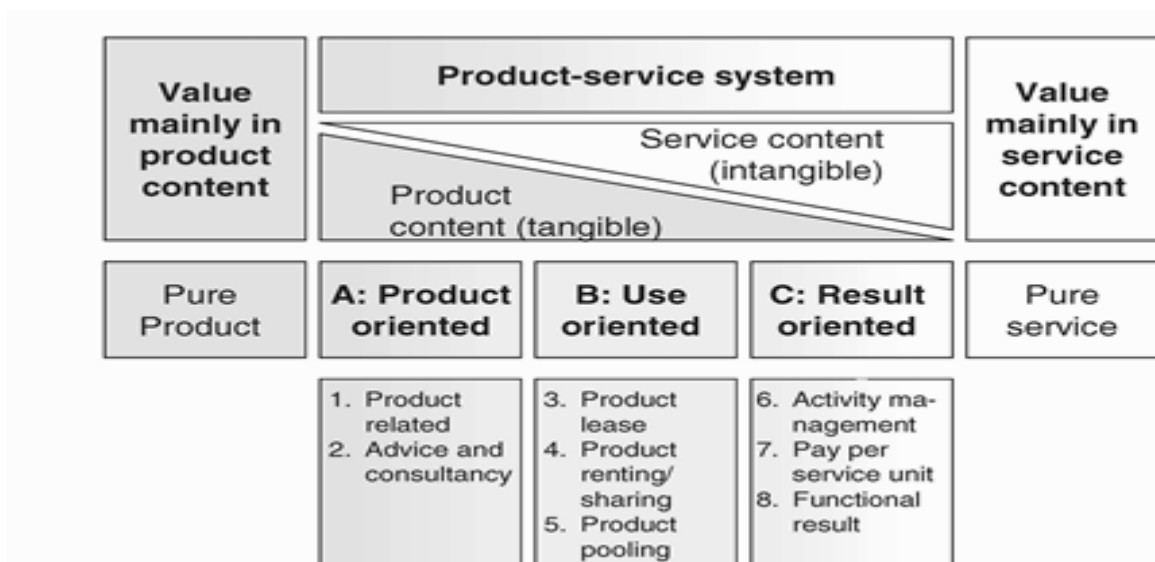


Figure 1. Main and subcategories of PSS (Tukker 2004)

The *first* main category is *product-oriented services*. Here, the business model is still mainly geared towards sales of products, but some extra services are added. The *second* category is *use-oriented services*. Here, the traditional product is still playing a significant role, but the business model is not geared towards selling products. The product stays in ownership with the provider, and is made available in a different form, and sometimes shared by several users. The *third* and last category is *result-oriented services*. Here, the client and provider in principle agree on a result, and there is no pre-determined product involved (Tukker 2004).

With attempts to remain competitive and to avoid a deteriorating financial position, manufacturing companies have increasingly turned to the provision of industrial services and solutions such as 'product-service systems'. This so-called service infusion is frequently seen as a transitional path from transactional product sales to the provision of relational services and solutions. This happens even in the form of a result-oriented service where, as described by Tukker (2004), the client only buys a guaranteed result of an activity (e.g. due to a Service Contract).

In parallel with growing attention that service-transition phenomenon has received in the literature, the 'service-dominant logic' (S-D logic), first proposed by Vargo and Lusch (2004) and extended in subsequent works (2006 and 2008), has emerged as the most important marketing debate in the last decade. S-D logic has also received increasing attention in relation to topics such as 'servitization' and PPS-development, life cycle management, business model innovation and customer value.

What Vargo and Lusch emphasized was how a supplier's knowledge resources and core competencies, i.e. the capabilities of the supplier, are fundamental to the company's value propositions, which are the basis for business interaction in networks, and the underlying thought behind S-D logic to reduce or even erase the distinction between products/goods and services. Value in the economy is determined in, and by, the customers' use, and not accumulated by a refinement of raw material in a production process. The idea that the value is determined by use (value-in-use), changes the business logic and places importance upon understanding the value-in-use situation and the user, e.g. the performance and outcome of Wind Farms.

This growing attention to manufacturers' service operations is most commonly understood as a necessary accommodation of services in today's globalized business

world. However, the S-D logic goes further, treating any knowledge-laden interaction between buyers and supplier as a service. To better understand the principles of S-D logic it can be compared to the business logic that has traditionally prevailed in industry, which is referred to by Vargo and Lusch (2004) as G-D logic. This they argue, is based upon the assumption that economic value is added through industrial processes, embedded in the production of goods and their distribution. The economic value is then realized in business exchange transactions, this is, value-in-exchange. In contrast, under S-D logic, goods are the distribution vehicle for service provision. The value of goods is based on their value-in-use and determined by the customer. Goods therefore, act as service appliances in the hands of a customer and the role of the supplier of goods becomes that of a collaborative resource integrator and co-creator of value together with the customer.

The controversial issue with regards to value-in-use is that every business then becomes a service business, because what is sold is the serviceability of goods in use. In S-D logic a distinction is made between *operand resources*, which are usually tangible, static resources that require some action to make them valuable, and *operant resources*, which are usually intangible, dynamic resources that are creating value (Vargo and Lusch 2004, 2008). Whereas the emphasis is on operand resources under G-D logic, operant resources are the key to competitive advantage from an S-D logic perspective.

Furthermore, under S-D logic, business innovation is repositioned and made possible through value co-creation. The shift in focus, from a producer to a customer perspective (Grönroos 2007) and then from a customer perspective to value-in-use, is a shift from a focus upon the product to a focus based upon the use of the product.

Interacting with customers to co-create value involves improving business value propositions, supported by supplier resource integration, knowledge, and skills, something which Vargo and Lusch (2004) argue is very difficult for competitors to replicate. It involves rethinking the business' resource application in time, place and context. Thus, a transition to S-D logic implies much more than emphasis upon the manufacturing business' product-service system: it implies a reframing of the whole purpose of the business and its collaborative role in value co-creation.

Altogether, the product-service transition and the transition from G-D to S-D logic due to Kowalkowski (2010) must be two distinct aspects of the 'servitization' of industrial business: the first reflects a strategic repositioning of the manufacturing company in the marketplace through the addition of new services to its core offerings, and the second reflects a new perspective on value creation.

S-D logic does not imply that companies should focus solely on services and out-source manufacturing activities. Instead S-D logic offers some normative guidelines for business practitioners (Vargo and Lusch, 2006):

1. The company should be transparent and ensure two-way symmetry in the information exchange process, because the customer is a collaborator, which necessitates complete openness.
2. The company should strive to develop close relationships with customers having a long-term perspective.
3. The company should view goods as transmitters of operant resources (embedded knowledge) and focus on selling service flow.
4. The company should support and make investments in the developments of specialized skills and knowledge that are the fountainhead of economic growth.

From these four guidelines, it is possible to provide recommendations for managers and for engineering and design practice. Regarding the first guideline it is critical to secure balanced knowledge sharing and symmetrical information exchange for successful value constellations and propositions. That is one of the reasons why OEM's such as the Danish wind power company Vestas, is eager to sign full service agreements for the customer's wind power turbines and wind farms.

Following S-D logic orientation and the open-ended time-logic it implies, the second guideline means that the ability to participate in co-creating of superior lifetime value-in-use for the customer and to derive an equitable part of value is vital. A focus on lifetime value - or a life-cycle perspective - implies that the OEM needs to apply a holistic perspective on value creation and customer relationships, and not only to view product and service sales as being separate and static.

To develop long-term customer relationships, companies need to have a thorough understanding of their customers' operations, from both a technical perspective and a business perspective. Lifecycle costs and service aspects such as maintainability,

reliability and supportability are increasingly becoming requirements for manufactured products. These aspects must be included in the early phases of the design process. From a design engineering perspective, 'product-service systems' development incorporates the concept of complete system thinking including service and maintenance, and is not simply just an engineered product.

This means that product design and development skills need to be combined with service engineering methods and tools. The starting point should be to identify and seize opportunities for value creation for the customer and the provider, rather than product technology, per se. This requires companies to have established processes and methods to understand customer needs and to integrate them into engineering design.

Developing customer and supplier relationships also relates to the third guideline. Under S-D logic customers and suppliers to OEMs are potentially part of the co-innovation process. This means that not only active but also passive customers unwittingly co-design "patterns of behavior" that OEMs can use to improve their offerings. Therefore, when developing new 'product-service system' (PSS) offerings or upgrading existing ones, design engineering should consider how additional information and communication technology (ICT) can be integrated into the system enabling a better collection of customer usage by exploiting insights from 'big data'. An example of this is Vestas' SCADA (Supervisory Control and Data Acquisition) system, which is a system that monitors and controls power plants around the world. By working together, the supplier and the customer can identify opportunities for innovation in which future value can emerge, and from an S-D logic perspective customer input should be an integral part of each phase in PSS development and design (Edman 2009).

Finally, the fourth guideline emphasizes a long-term financial orientation that does not necessarily fit well with the short-term financial goals that tend to drive Western capital markets. Financial feedback is a multidimensional, long-term metric in S-D logic. It is not equivalent to profit, as it may include cash flow, market share, sales, growth etc. (Vargo and Lusch 2006). Despite this challenge, a general mindset change is necessary to succeed with S-D logic thinking and practice. Because ser-



vice advantages are predicted to dominate business in the coming 5 – 10 years, investment in specialized service-related skills and knowledge will become even more important, although not profitable in the short run. Also, feedback loops from skilled service personnel are important to design equipment that is not only easy to assemble in the manufacturing plant but also easy to replace in the field. Service modularity is another topic of growing importance and the ability to design modular service platforms and processes is of concern for PSS providers.

By acquiring new service capabilities and changing the design approach companies not only move along the product-service transition line but also along the transition from goods-dominant to service-dominant logic. Applying S-D logic as a market orientation also means that the traditional division of goods sales from after-sales services and solutions are no longer discrete functions, and this elevates the strategic importance of the whole lifetime value of customer's relationship, regardless of the combination of services and goods.

In accordance with S-D logic, knowledge is regarded as the fundamental source of competitive advantage, and the acquisition of specialized skills and knowledge a prerequisite for the ability to offer new types of service and PSS. This means that effective organizational learning as well as the ability to unlearn G-D practices and mindsets is needed. It implicates a strategy development process which have clear resemblance to what James Quinn (Quinn 1980 and 2003) described as *logical incrementalism* (cf. also Kowalkowski et al 2012), i.e. the development of strategy by "experimentation and learning from partial commitments rather than through global formulations of total strategies" (Quinn 1980)

This is also the case regarding knowledge sharing and networking and the way value chains are linked together in complex systems of 'net chains', where suppliers to OEMs are becoming much more globalized supplying more than one regional market and turbine manufacture and even becoming part of package solutions organized by 'system integrators' instead of supplying individual components (Danish Wind Industry Association 2012). This development is also present in the service provision of developers and operators of wind farms.

## Methodology

Although this paper is more conceptual in nature it is grounded on empirical examples from the Danish wind power industry and especially insights from the Danish global wind power OEM and player Vestas to illustrate some of the main tenets. Given that the phenomenon under investigation is in the early and developmental stages of research, a case study is chosen as an appropriate research method for improving the understanding of the transition of manufacturing business into a more complex product-service system. An exploratory case – Vestas – is used to point out factors that may be important in this PSS transition. As a global player on the wind power market Vestas serve as a case organization considered as an exemplar in terms of PSS strategy and ‘servitization’ in manufacturing of wind turbines. The organization’s O&M (operation and maintenance) program includes whole- life support of wind turbines and wind farms (up to 20 years), energy-based availability guarantees, yield optimizing and performance management systems by using ‘big data’ etc. Data analysis was driven by three explicit goals; to understand the product and service attributes that constitute the complete company offering, to understand the value those attributes propose to the customer, and to understand and document the implemented operation design and processes and the roles that different actors took within the process.

The extent to which the case company has transitioned from pure product offerings and G-D logic to those present in a complex product-service setting dominated by S-D logic is off course and open question in the present stage of the research process and must be investigated in more details. But there is clear indication in the empirical data about Vestas that specific market conditions, the complexity of wind turbines (capital goods) and service offering, use of ‘big data’, institutional ‘set ups’ on different geographical markets and customer relations have an important impact on the process of ‘servitization’ in the industry. Given these conditions, the case organization should be considered a ‘strategic’ and ‘critical’ case, which has the potential of providing empirical evidence in relation to the realities of P-S transition and S-D logic, and the case organization provides a rich setting in which to address main research questions.

### Example: The wind power industry (Vestas)

Wind Turbines today are a proven source of clean energy, but it also represents a complex technology which demands maintenance and operational improvements; since many wind turbines have been plagued with downtime problems causing huge operational and maintenance costs to the users. While a system availability of 97 % is now commonly attainable globally, there is still some room for improvements by use of a wider range of sensors and ‘*big data*’, capable of providing more insight into performance and reliability and, as a result, facilitate optimization of the wind power systems (Wind Energy Update 2016). The problem is that system availability starts to decrease after five years of operation and by six years only half of the turbines operates above 97 % benchmark. The wind power industry is therefore highly focused upon developing new operation and maintenance services to optimize the wind power systems at minimal cost to the customers.

With the annual installed capacity growth rate slowing down due to the global economic crisis in 2008 (GWEC 2012), service agreements became means by which wind turbine manufacturers remained profitable the following years. Seen as ‘complex service systems’ (Neely 2011) service agreements are characterized by:

- An integration and coupling of the producer with their customers,
- An increase in financial flows from service business,
- The need to build more complex supply networks (“net chains”),
- Long-term and output based contracting
- Containing and handling new forms of risk,
- A focus on value-in-use and co-creation,
- The transformation from a ‘production’ to a ‘service’ culture,
- An increase in technological complexity and integration of design of products, manufacturing and services in a continuous innovation process (“new capabilities”).

With the variability in the installation rate of wind turbines since 2008 and profits plummeting due to intense competition in the industry and falling prices, there has been a rush of new companies looking to grab a piece of the maintenance market – many of the providers owned by manufacturers and wind farm developers. Maintenance has therefore become a major headache for many developers, as more prob-

blems in turbines emerge – often in batches – because of poor-quality components from suppliers on new markets and the aging and degradation of components, especially after eight years of operation. The need for detecting turbine failures as early as possible increase the demand for smarter implementation of maintenance practices based on ‘big data’ and sophisticated software.

Developers are therefore today demanding that turbine manufacturers extend their warranty period to five or ten years, or even more. Often when the warranty period expires, large developers generally operate and service turbines with their own branch companies specializing in O&M (Operation & Maintenance). Other leading wind-farm developers have their own service teams, even though they have not established subsidiary maintenance companies. Smaller wind farm developers prefer to commission turbine manufacturers or third-party companies providing maintenance service after the warranty period expires, so depending on the customers the leading manufactures of turbine choose different corporate strategies for organizing the service offerings internally or externally. According to HIS Emerging Energy Research, annual expenditures of wind farm operations and maintenance in the U.S. will exceed 5.6 billion USD by 2025, i.e. more than double the amount spent on O&M in 2011. In fact, O&M services for wind energy are expected to account for more than one-third of total capital expenditures in the U.S. wind power industry over the next decade (Del Franco 2013), which will change the specific *market* for the manufacturers of wind turbine and have a major impact on their corporate strategies.

Therefore, some turbine manufacturers who don’t want to lose the maintenance business and market, have set up branch companies offering specialized maintenance services to wind farms in and out of the warranty period. However, when the wind power developers and operators’ original equipment manufacturer (OEM) warranties expire, newcomers are venturing into the third-party services arena as independent service providers (ISP), creating a much more complex and competitive situation on the wind power service market.

If the installed capacity is steadily increasing, the demand for service and maintenance in the wind power business is also constantly rising, or even in some cases exceeding the installed capacity. It is therefore anticipated that by 2020, turnover and margins in the service and maintenance business will be even more attractive than the construction of onshore and offshore wind farms. In the Annual Report 2016 from

Vestas (Vestas 2017) it is even said that the earnings from service contracts in 2016 exceeded the earnings from their main activity in design and construction of wind turbines (manufacturing), and is even expected to increase at a higher rate in the years to come.

With the warranties expiring for an increasing number of wind turbines over the coming years, the market, as described earlier, will open for many new O&M businesses (Deloitte 2012). Shifts in value chains and market models are likely to contribute to significant new market opportunities for the wind power manufacturers, due to competition from in-house and independent service providers. This means that a service-dominant logic will be even more prevalent among wind power manufacturers, emphasizing the widespread process of 'servitization' in the wind power industry.

As an increasing number of wind turbines come out of their initial OEM warranty maintenance contracts, increasing opportunities are being presented for ISP's to gain a market share. This increasing number of post-warranty maintenance contracts in the market, together with the advantages of ISPs in respect of cost efficiency, local market knowledge and accessibility is likely to result in an increase in their market share. That's why OEMs, who typically have signed O&M contracts covering two to five years, now are seeking to retain their share of the O&M market by offering the wind power developer and operators long term warranty contracts/full service agreements (including performance guarantees for the wind power gear of the wind turbines) of up to twenty years for existing and new customers. In this respect, the OEMs see the wind power business as an opportunity to diversify their businesses and secure additional sources of revenue in an increasingly competitive wind power market (Deloitte 2012).

Turning to the Wind Power Industry as an example of sustainable production and consumption which represents the new, more service-oriented model of manufacturing growth, the key competitive factors are such as the capability for continuous innovation, improved design and quality and customized goods, rather than the production of large volumes of standardized products (Mont 2002).

Wind Turbines, a core technology of modern wind power, are a proven source of clean energy with wind power harvesting technologies supplying about 3 percent of global electricity consumption today, but is expected to generate around 15 percent

of Europe's electricity by 2020, rising to around 50 percent by 2050 (EWEA 2012). In Denmark one of the leading countries of wind power technology more than 25 percent of the electricity in 2012 was generated by wind power, and the official aim of the Danish government is, that in 2020 50 percent of Denmark's electricity consumption will be generated by wind power.

With the increasing use of wind power follows an increasing demand on maintenance and operational improvements since many turbines have been plagued with downtime problems of major components, e.g. gearboxes and generators, especially with offshore turbines which are difficult to access (Igba et al 2013) causing huge operational and maintenance costs to the users. The wind power industry is therefore focused upon the development and use of an integrated Product-Service Systems approach to wind turbine operation and maintenance, optimizing the asset value adding contribution at minimal total cost to the operator, which imply close *customer relations* and a focus on collaboration and co-creation in the design and development of turbines and services.

The ability to plan, build, operate and service complete wind power plants customized for the customers is increasingly becoming important for wind power manufacturers such as Vestas. Today customers are also demanding individual solutions that give them maximum performance at minimal risk. As a global wind power manufacturer Vestas therefore must be able to deliver value, both, before, during and after the customer has invested in a wind power plant (Vestas, Annual Report 2012, 2013).

In the wind power industry, it is not uncommon to see many of the wind park projects and wind power plants having some form of operation and service agreement or warranty structure between the turbine manufacturer and the customer. In the case of Vestas 96 per cent of all turbines sold by the company are on some form of service agreement. These agreements may run from 2-3 years up to 10 years or more (for a full-service agreement). Vestas has what they call the Active Output Maintenance service program (AOM), which has 5 stages depending on the level of turbine services the customers are willing to pay during the life time of the turbine (on average around 20 years). With the risk involved in the wind power business, most of wind park owners/operators sign full agreements with the turbine manufacturers. It is then the responsibility of wind turbine manufacturers to ensure that the turbine is moni-

tored continuously and is always available. Once there is a fault, they are also responsible for the maintenance and repair. This has both disadvantages and advantages for the turbine manufacturers, because on the one hand it incurs costs for downtime of a failed turbine but on the other hand also help turbine manufacturers to improve the quality and reduce costs of their products and services (Igba et al 2013). This change into a 'performance related offering' also changes the business and revenue model of Vestas.

Seen as a 'complex service system' (Neely 2011) the Active Output Maintenance program of Vestas can be described with the same common features of service complexity as identified in the literature of 'servitization' and Product-Service Systems (PPS), i.e. a tendency to:

- move into service business that involve a closer coupling and integration with the customer and the development of new capabilities,
- increasing financial flows from service business,
- changed supply networks with a focus on package solutions,
- long-term and output based contracting,
- new forms of risk,
- focus on value-in-use and co-creation of value,
- transition of the organization (the development of a service culture),
- increase in technological complexity together with an integration of product design, manufacturing and services in the innovation process.

All together it is important to look upon 'servitization' in manufacturing of wind power plants and other complex Product-Service Systems such as the manufacturing of aircraft engines, development of complex ICT systems as a process which include the whole product lifecycle of a wind power plant. The process of design and product development, testing and validation, process planning and manufacturing, but also construction, plant operation and management, service and maintenance, spare parts and repair must be fully integrated with continuous feedback loops to secure the optimal value-in-use for the customer. The *complexity of the goods and services* delivered by the wind turbine industry therefore represent a driving force behind the process of 'servitization' of the manufacturing firms in the industry,

This changes and reverses the whole product-service innovation process because every design of a new wind turbines calls for a more holistic view to design of e.g. wind turbine gearboxes (and other components), where the serviceability and operation life is considered during the initial stages of the design process. Introducing 'serviceable product designs' of wind turbine gearboxes increases the possibility that the future up-tower repairs of wind turbines will have tremendous cost savings for the costumers. Being able to replace major components on site (up-tower) will remove all the costs attributed to transport and logistics. The only cost accrued during repair will then be spare parts, technician transport and labor costs.

Today electricity from onshore based wind turbines is cost-effective with traditional coal fired power stations. With increasing focus on off-shore wind turbines the next step is to optimize all parts of the supply chain in the wind power industry to bring down cost of energy for off-shore turbines. In 2004 Vestas Wind System a division of Vestas installed 30 wind turbines in two years at North Hoyle, one of the UK's first off-shore wind farms. In 2010 Vestas Wind System installed 100 off-shore turbines in 100 days at Thanet Wind Farm, another location in the North Sea (Danish Wind Power Association 2012).

This accelerated construction of off-shore wind farms is due to greater efficiency and increased collaboration in the supply chain, all the way from the company that lays the sub-sea cables to the wind turbine manufacturer (OEM) itself. But although the markedly increased efficiency in the wind power industry has reduced the cost of producing energy from wind power, it is still more expensive to produce electricity from off-shore wind power farms than from fossil fuel-fired power stations. The challenge for the off-shore wind power industry remains that of bringing down the price of all the parts of construction and operation of an off-shore wind power turbine.



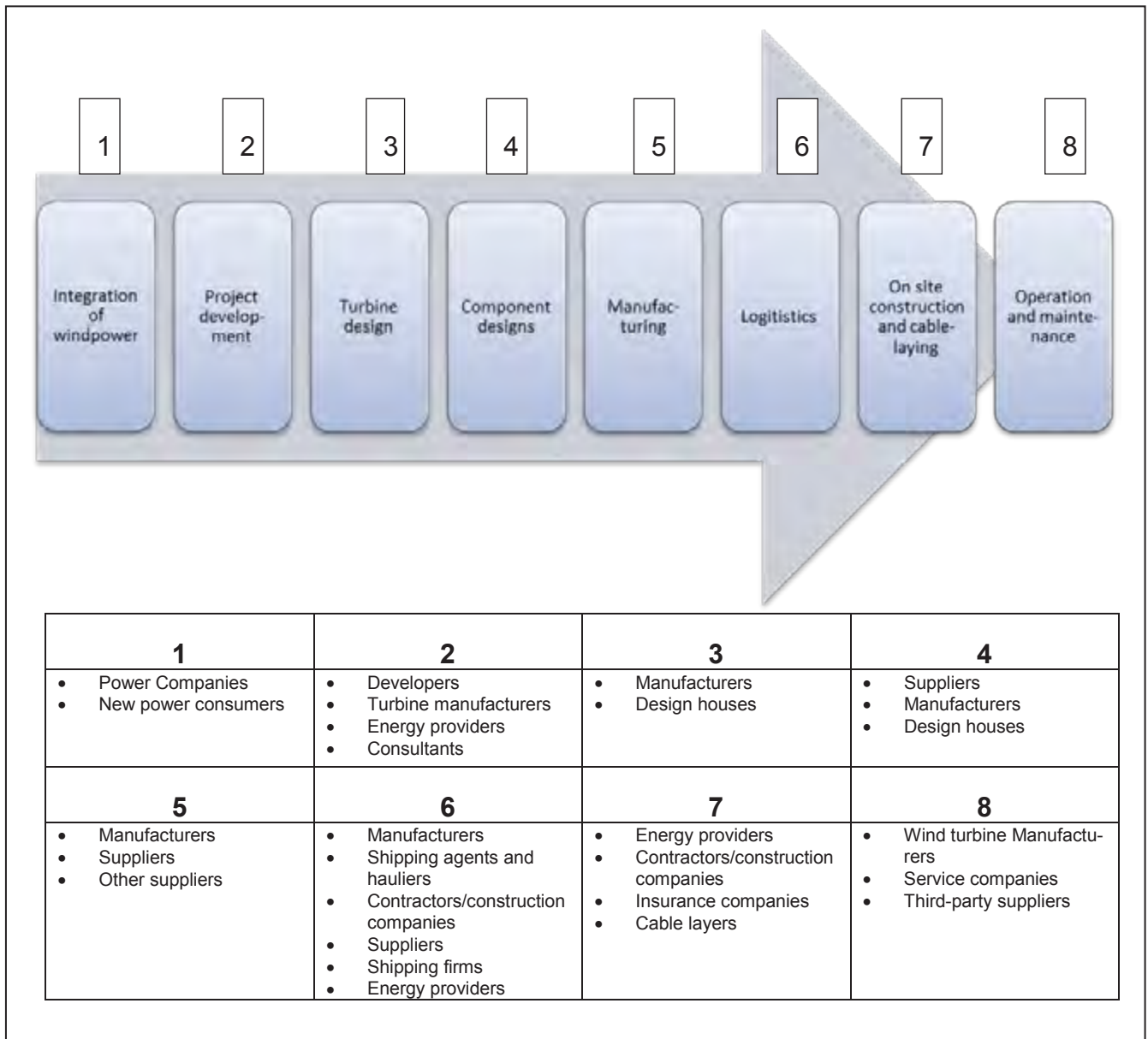


Figure 2. The supply chain of wind power turbines (Hansen and Drejer 2012)

As mentioned above, one factor that is important to users of wind power farms is operational reliability. To achieve it, all actors in the supply chain must work close together (See Figure 2) – be open and share knowledge – to develop their capabilities and services in close relation to the customers.

To a much greater extent than previously, value in the wind power industry is generated through interaction between productions, knowledge, logistics and services. It means, that collaborations that address the challenges of the entire value net chain, instead of only focusing challenges in relation to the closest business partners is needed. The dialogue and knowledge sharing process should focus on solving cus-

customer problems and challenges to the entire net chain. Tackling this process in the right way would probably lead to opportunities of substantial process innovation, which will be exploited through the transition of the product-service system and the use of a service-dominant logic.

Continued development of the entire energy system, which both on-shore and off-shore wind power plants are part of, is also needed, if the proportion of wind energy must be increased and the wind power plants become cost-effective as power stations. It depends on the '*institutional set up*' on different geographical markets, i.e. how government and international organizations support and intervene in the production and consumption of energy ("energy policy"). Three conditions are necessary to be met if wind energy is going to develop further and strengthen its role in the future energy system. Firstly, a strong international grid to enable energy balancing over a large area must be created. Secondly, a continued improvement of flexibility on both the production and consumption side must be secured. Thirdly, the development of a 'smart electricity grid', that automatically regulates the production and consumption, whereby the interconnected elements in the energy system are operating together in an optimal way (Danish Wind Industry Association 2012).

All together the findings of this investigation into examples of servitization processes in the Wind Power Industry show a sustainable production of clean technology and consumption of energy influenced by a service-dominant logic (Vargo and Lusch 2008), where the key competitive factors include such as the capability for continuous innovation, improved design and quality and customized goods and services, rather than the traditional manufacturing of large volumes of standardized products and energy technologies (Mont 2002), but also the importance of changes in the economic environment and the specific markets, which wind turbine manufacturing firms operates at, the deepening of their customer relations, the use of 'big data' and sophisticated software systems and the institutional set up at different geographical markets (e.g. US and Europe)

## **Discussion**

Although S-D logic theoretically shifts the unit of analysis from manufacturing and products to value creation (services), in practice, it is first a mindset and an organizing framework rather than a fully developed theory (Vargo and Lusch 2008). The dominant position of G-D logic in business (and academia), and consequently its re-

stricted view upon value creation in relation to the provision of services in product-service systems, means that many opportunities for value creation and competitive advantage may be obscured or even lost.

One may argue that it would be more appropriate not to mention products (indirect service provision) and services (direct service provision) at all, but rather focus on the overall “application of specialized competences” in business. That would most likely imply the abandonment of the integrated product-service system definition such as that of Grönroos (2009): “an integrated product and service offering that enables co-created value-in-use in the customers processes, in a mutually beneficial way”, in favor of a more generic concept such as the “integrated complex system” or “complex service system”.

But such a definition would neglect the fact that the integration of products and services is specifically a growing key issue for many traditional manufacturing companies, and the question of how to best integrate these elements is a growing research area within both the manufacturing science and technology and the marketing and management fields as well.

Even in new manufacturing industries such as the wind power industry the findings presented in this paper shows a transition from a dominant G-D logic to S-D logic, where wind power companies experience an increase in service offerings (Service Agreements) to their customers and an increase in their revenues from service business activities changing their business model and corporate strategies (illustrated by the world leading wind power company Vestas), but also the variability in the impact on ‘servitization’ from driving forces such as the development of specific markets, the complexity of wind turbine technology, use of ‘big data’, customer relations and the ‘institutional set up’ on different geographical markets (US versus Europe).

Overall there is a need to develop the S-D logic argument (and theory) further in relation to both the classifications of different product-service systems with the aim of identifying specific types, factors and processes of importance to PSS in manufacturing industries such as the wind power industry, but also to changes in traditional supply, knowledge and value chains in these industries due to a more globalized econ-

omy creating more complex knowledge and value networks or 'net chains' of suppliers, OEMs and service providers.

## Conclusion

This paper has been focusing on the process of 'servitization' in relation to a manufacturing industry such as the wind power industry, because service provision to developers and operators of wind power turbines and farms nowadays plays an increasing role in the overall business activity and earnings of OEMs of this industry. The process of 'servitization' has been discussed in relation to theories of product-service systems (Tukker 2004) and S-D logic (Vargo and Lusch 2004) to better understand the types of PSS in operation and factors influencing both changes and processes of manufacturing and service provision in the wind power industry, but also in relation to different service components and driving forces.

One important implication of the findings in this paper is, that it is crucial to look upon 'servitization' as a process, which includes the whole lifecycle of a given product including the design and construction stages through to full operation and maintenance over many years of the finished product in use either alone or integrated in a larger system (e.g. a wind power turbine or wind power farm). This secures the optimal value-in-use and cost-saving potentials for the customer, which increasingly is becoming important to customers focusing on the effect or result of the product in use rather than the product itself. It changes the role of the manufacturing firm because focus is increasingly on 'selling life-cycle solutions' and operating a 'performance related' activity offering 'value-in-use' to the customer rather than just selling capital goods and services. Overall it thereby changes the business and revenue model of the companies.

It also changes and reverses the whole product-service innovation process, and every design of e.g. a new wind turbine thus calls for a more holistic view to product design, because the serviceability during the whole operational life must be considered even during the initial stages of the design process.

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## VALUE COCREATION IN SERVICE ECOSYSTEMS - AN ANALYSIS OF REFUGEE SETTLEMENT AND INCLUSION

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*This paper explores how various institutional logics influence the making and maintenance of service ecosystems. The service ecosystem perspective perceives value cocreation as holistic endeavours, based in interactions between multiple systems of actors. We integrate this perspective with institutional logic theory, and use the proposed framework to analyse value cocreation and resource integration in refugee settlement in a Norwegian municipal context. The paper thus contributes by making a novel empirical demonstration of how institutional logics influence on value cocreation in service ecosystems. Furthermore, the study introduces the service ecosystem perspective in a non-commercial service context.*

### 1. Introduction

The service dominant logic (S-D logic) was introduced as perspective to challenge the economical based paradigm of goods dominant logic (G-D logic). The latter emphasizes manufactured output and value-in-exchange, as opposed to seeing value as being co-created, derived and assessed in use (Vargo & Lusch, 2004, 2008). Over the last decade, the S-D logic perspective, has been revised, elaborated and extended (e.g. Vargo & Akaka, 2009; Vargo & Lusch, 2008, 2016). The development has amongst other led to the introduction of a service ecosystem perspective (e.g. Vargo, Lusch, & Akaka, 2010; Vargo, Maglio, & Akaka, 2008).

The service ecosystem perspective moves beyond a more conventional understanding of value (co)creation as resulting from dyadic relations between firms and customers (or providers and beneficiaries) (Vargo & Lusch, 2016). Following the service ecosystem reasoning, such dyadic relations needs to be seen as embedded in broader social structures, in which multiple actors take part in value cocreation through resource integration (Edvardsson, Tronvoll, & Gruber, 2011).

Vargo and Lusch (2016) hold that this extended model of value cocreation relies on insights on the workings of institutions, and they advocate the relevance of institutional theory. The institutional logic perspective is presented as one relevant body of literature within institutional theories (Edvardsson, Kleinaltenkamp, Tronvoll,

McHugh, & Windahl, 2014; Vargo & Lusch, 2016). We follow up on this by using institutional logics theory (Friedland & Alford, 1991; Thornton, Ocasio, & Lounsbury, 2012) as a lens to analyse service ecosystems dynamics in a non-commercial service context.

Even though S-D logic and the service ecosystem perspective has gradually evolved to a generic framework for understanding value cocreation in diverse forms of exchange (Vargo & Lusch, 2008, 2016), the perspective originates from marketing and has mainly been used to rethink value creation in firm-customer relations. Public administration researchers have adopted elements from S-D logic, and work with explorations and adjustments of the framework to public service contexts (e.g. Alford, 2016; Osborne, Radnor, Kinder, & Vidal, 2014; Osborne, Radnor, & Nasi, 2012). However, empirical anchoring of S-D logic and the service ecosystem perspective in non-commercial service contexts is still limited.

This paper makes an empirical contribution by exploring how the workings of public services to refugee immigrants in Norway can be better understood from a service ecosystem perspective. Second, we aim to contribute conceptually by further explicating the relevance of linking the notion of service ecosystems to institutional logics theory. More specifically, we bring attention to the competing institutional logics at play in service ecosystem by addressing the following research question:

*How is the presence of competing institutional logics implicated in the making and maintenance of service ecosystems?*

The research question indicates that value cocreation in service ecosystems can be seen as conflicted rather than harmonious processes, which is a somewhat marginal stance (Skålén, Aal, & Edvardsson, 2015). Thus, the conflicted nature of value cocreation in service ecosystems deserves more attention. Empirical studies set in public sector services provide a fruitful entrance in this regard, as public services tend to be underpinned by contradictory values objectives and demands (Alford, 2016).

## 2. Theoretical framework

This section draws on S-D logic as a perspective for studying value cocreation processes in service ecosystems (e.g. Maglio & Spohrer, 2008; Vargo & Lusch, 2016; Vargo et al., 2008). The first section briefly presents value and value cocreation in service ecosystems. Subsequently, institutional logic is introduced as a perspective to broaden and illuminate the processes of resource integration and value co-creation.

### 2.1. Value cocreation in service ecosystems

From a S-D logic perspective service is defined as *the application of competences (knowledge and skills) by one entity for the benefit of another* (Vargo & Lusch, 2004, 2008). The S-D logic's conceptualization of service underlies an understanding of service, without the "s" as in services, hence it moves beyond a more traditional

focus of service research as an intangible output of firms, towards a general perspective for understanding value creation. SDL argues that the creation of value commonly takes place through integrating tangible and intangible resources. The role of organizations is to support and assist customers' (users')<sup>1</sup> value creation processes, making them better off (Grönroos & Voima, 2013), rather than producing and delivering output. Furthermore, S-D logic holds that value is being co-created through the combined efforts of firms, employees, customers, stakeholders, government agencies, and other related entities, although, always determined by the beneficiary, (Vargo et al., 2008). Accordingly, value cocreation is not viewed as a dyadic relationship, but as a multi-actor phenomenon, where actors cocreate value through using and combining resources in different ways (Vargo & Lusch, 2016).

The shift from a dyadic relationship to a dynamic approach, where multiple actors collaborate and act as resource integrators is captured through the perspective of service eco systems (Vargo, Wieland, & Akaka, 2016). A service ecosystem is defined as *relatively self-contained self-adjusting systems of resource-integrating actors connected by shared institutional logics and value creation through service exchange* (Vargo & Akaka, 2012, p. 207). It is argued as a framework for studying systems of service systems<sup>2</sup>. The service system is understood as an arrangement of resources (e.g. people, technology, information) connected to other systems by value propositions (Maglio & Spohrer, 2008; Vargo et al., 2008), and the service ecosystem as a lens for studying interaction and value creation among multiple service systems (Vargo & Akaka, 2012). It draws attention to the importance of interactions *within* and *between* service systems, and the social contexts that frame value cocreation (Aal, Di Pietro, Edvardsson, Renzi, & Guglielmetti Mugion, 2016; Edvardsson et al., 2011).

Following the basics of structuration theory (Giddens, 1984), service ecosystems are seen as embedded in social systems consisting of social structures that both enable and constrain actions (Edvardsson et al., 2011; Åkesson, Skålén, Edvardsson, & Stålhammar, 2016). This resonates with institutional logics theory, which holds that society consists of an interinstitutional system comprised of a set of macro level institutional orders (Friedland & Alford, 1991; Thornton et al., 2012). These institutional orders frame institutional logics at the meso level, which in turn constrain and enable micro level action. We elaborate next on institutional logics theory, and indicate its relevance for understanding the dynamics of value cocreation in service ecosystems.

## 2.2. Institutional logics theory

The Institutional logics perspective is both a meta-theory and a method of analysis, anchored in institutional and neo-institutional theory (Thornton & Ocasio, 2008). The origins of the perspective links mainly to Friedland & Alford (1992) who perceive society as an interinstitutional system. In the capitalist western societies this system is seen as constituted around five basic macro institutions, or institutional orders: The capitalist market, the bureaucratic state, democracy, the nuclear family and Christian

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<sup>1</sup> User is invoked as a general term for those who benefit from service and can be paying customers, patients, or clients (Vargo and Lusch, 2004)

<sup>2</sup> A service system can be anything, from an individual to a firm, group or organization as long as they can work with others, apply and integrate resources (Vargo et al., 2008)

religion. In the revisions and further developments of the perspective, the institutional orders have been more clearly developed as ideal types and analytical categories, detached from specific institutional sectors. The interinstitutional system consists in the revised form of: Family, community, religion, state, market, profession, and corporation (Thornton et al., 2012).

As ideal types, basic characteristics can be linked to these different institutional orders (Thornton & Ocasio, 1999; Thornton et al., 2012). The institutional orders are seen as symbolic systems that enable, constrain and legitimize individual and organizational behavior. Institutional logics are more specifically defined as:

*The socially constructed, historical patterns of cultural symbols and material practices including assumptions, values, and beliefs, by which individuals and organizations provide meaning to their daily activity, organize time and space, and reproduce their lives and experiences (Thornton et al., 2012, p. 2).*

Institutional logics can more simplified be seen as various underlying assumptions, which constitute frameworks for valid and invalid forms of reasoning within specific contexts. The boundaries of different logics are not clear cut; they may overlap and co-exist, but articulating various logics give a framework for identifying how practices and reasoning are deemed legitimate or illegitimate depending on the context. It is important to note that different industries, sectors or organizations do not enact one kind of institutional logic, but multiple. Still, some logics, and institutional orders, tend to be more dominating than others depending on specific organizational contexts.

The institutional logic perspective marks a break from the dominant focus on isomorphism in neoinstitutional theory (DiMaggio & Powell, 1983). Research associated with institutional isomorphism addresses how organizations become increasingly similar through structural alignments, caused by conditions in the institutional environment. The weak spot of this research stream lies in the poor conception of the role of agency, and in the tendency to mainly focus on institutional preservation rather than change. The institutional logic perspective incorporates a more explicit conceptualization of agency with the notion of “embedded agency”, which refers to how interests, identities, values, and assumptions of individuals and organizations are embedded within prevailing institutional logics (Thornton et al., 2012). The perspective stresses in this way the interconnections between the individual, organizational and the macro level.

Moreover, the perspective was developed as an approach to explain institutional change, and opportunities for change was found in actors' positioning at the crossroads of contradictory or incompatible logics (Friedland & Alford, 1991). Institutional logics theory has been mainly applied to capture transformations at the organizational field level. Research has largely focused on identifying dominant logics, and depicted changes in industries or fields as shifts in dominant logics (Edvardsson et al., 2014; Lounsbury, 2002; Thornton & Ocasio, 1999). However, the institutional logic perspective can also be used to shed light on implications of coexistence of competing logics (Jay, 2012; Reay & Hinings, 2009; Saz-Carranza & Longo, 2012; Skelcher & Smith, 2015; van den Broek, Boselie, & Paauwe, 2014). We find that insights from the latter approaches will be useful for gaining enhanced understandings of value co-creation in service ecosystems.

As described, the idea of service ecosystems implies that actors from diverse sectors and organizational contexts participate as resource integrators to cocreate value. This implies in turn that service ecosystems are based in multiple institutional logics, and insights on the making and maintenance of such systems require in our view insights of how competing institutional logics are contested and negotiated. Rather than seeing service ecosystems as consisting of actors with “shared institutional logics”, as suggested among others by Vargo and Akaka (2012), we propose that service ecosystems also can be understood by paying attention to the multiple and competing logics at play in such systems. We aim to demonstrate and discuss the relevance of this approach in the remaining part of the paper, by exploring introduction services to refugee immigrants in Norway from a service ecosystem perspective.

### 3. Research context

#### 3.1. The introduction program

The empirical research is set in services aimed at ensuring integration and social inclusion for immigrants arrived as refugees<sup>3</sup> or asylum seekers in Norway. Refugees and immigrants granted asylum in Norway have the right *and* are obliged to participate in an introduction program, offered by the municipalities. Access to the introduction program also includes reunited family members. The program is sanctioned in the introduction act<sup>4</sup>, and was first implemented in 2004.

The program is full time five days a week, and consists of 600 hours of language training and social studies, which is provided free of charge within the first three years after settlement in the municipalities. Participants are entitled to introduction benefits granted as standard payments, with reductions in case of invalid absence. The aim of the program is to ensure that newly arrived immigrants gain insights in Norwegian culture and society; acquire basic Norwegian language skills; and that they qualify for employment or further studies. The purpose of the program is to enhance chances that newly arrived immigrants will be able to participate in working and social life, and increase chances of financial independence.

#### 3.2. Differing introduction programs

The introduction program is the most central integration measure administered by Norwegian authorities. The program is a rather costly investment, which is expected to pay off in the long run in terms of anticipated reduction of social inequalities and released pressure on public welfare schemes. The other Scandinavian countries

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<sup>3</sup> We use the term “refugees” about people registered as refugees by the High Commissioner for Refugees (UNHCR). This group is termed resettlement, or quota refugees, and they are registered for resettlement in a third country by the UN because they cannot be offered permanent solutions in the country they temporarily reside.

<sup>4</sup> The Act is an introduction programme and Norwegian language training for newly arrived immigrants (the Introduction Act) <http://app.uio.no/ub/ujur/oversatte-lover/data/lov-20030704-080-eng.pdf>

provide similar introduction programs, all of which are rather comprehensive when seen in a European perspective (Tronstad & Hernes, 2016). The introduction programs in these countries reflect the Scandinavian welfare state models more generally, which is based in a social democratic ideological foundation.

There are some differences between the programs in the Scandinavian countries even though they share similar traits. Notably, the Norwegian introduction program differs from the programs in Denmark and Sweden when it comes to municipal autonomy. Norwegian municipalities have more discretionary power to develop tailored programs adjusted to specific local needs and conditions. All municipalities are obliged to offer full time programs, but the central government controls and directs the municipalities to a more limited degree compared to the two neighboring countries (Tronstad & Hernes, 2016). This implies that Norwegian municipalities have developed diverse models for implementing the introduction program, which we propose to see as constructions of different service ecosystems.

It is expected that 70 percent of participants will be employed or enrolled in education one year after completing the introduction program. This national target was set in 2010, but has not yet been reached when considering aggregated results nationally. In the period from 2011-2014, the national results were ranging from 58 to 64 percent (<https://www.imdi.no/tall-og-statistikk/>). However, the results vary considerably across counties and municipalities. Studies show that the varied results cannot be explained by local labor market conditions, nor by participants' characteristics (Lillegård & Seierstad, 2013; Tronstad, 2015). This indicates that varied results are linked to the different local solutions of how the program is organized, designed and executed. However, further tests show that differences in formal organizational models cannot explain the municipalities uneven results (Tronstad, 2015). Explanations to differing degrees of "success" are rather expected to be found in the ways involved government bodies collaborate and coordinate resources, as well as their ability to involve and collaborate with employers in the local labour market and with civil sector actors (Røhnebak & Eide, 2016; Tronstad, 2015). Hence, the service ecosystem perspective is highly relevant for obtaining increased understanding of value cocreation in this research context.

### 3.3. Capturing the "value" of integration

To explore the application of S-D logic and the service ecosystem perspective in the immigration/integration context, we need to define how to understand value in this service setting. What is the value to be "co-created" in relation to the service schemes of the introduction program? Following S-D logic, value is not embedded in products or service schemes created by providers and then served to beneficiaries. Value is perceived as co-created in a reciprocal and mutual relationship between providers, beneficiaries and other actors (Vargo & Lusch, 2008, 2016). Value of the introduction program is thus not embedded in counselling, the social science classes, language tutoring, or vocational training provided by municipal actors. It is linked to how participants make use of competence derived from counselling and training to be able to participate in social and working life.

Consequently, integration, or social inclusion, are in broad terms the values to be co-created in this service setting. Yet, policies increasingly define employment (or

education leading to employment) as the ultimate means for social inclusion. This is linked to a broad trend in social policies across Europe, in which activation and conditionality is more persistently emphasized in relation to social security and welfare rights (Djuve, 2011). In Norway, this is clearly reflected in recent policy documents which stress the need to develop “work aimed” programs and service schemes (Stortingsmelding, nr.33 (2015-2016)). This also applies to integration policies and directions for the introduction program (Stortingsmelding, nr. 16 (2015-2016) ). It is required that the introduction program becomes more “work aimed”, which implies work aimed language training, more use of vocational training, closer collaboration with the employment services, the labour market etc. Social inclusion and employment is in this policy landscape inextricably entangled, and this interlinkage define value in our research context.

## 4. Methods

### 4.1. Research design

The paper is based on a multiple case study of three municipalities in Norway. The case study is described as a research strategy that focuses on *understanding the dynamics settings within single settings* (Eisenhardt, 1989, p. 534). It offers depth and comprehensiveness for understanding (Yin, 2009), which for our study’s purpose is more important than statistical generalization. The three municipalities are all located in the same region in Norway. They are all relative the same size (number of inhabitants) and have similar industry structure. Hence, the study is suitable for comparisons between the cases, and the results can be seen as more robust and representative compared to a single-case study (Eisenhardt, 1999; Yin, 2009). The study is based in “process data” (Langley, 1999), which means that it follows ongoing developments in organizational settings.

### 4.2. Data collection and data material

The data consist of interviews and document studies. 65 interviews have been conducted, some of them arranged as small group interviews (with 2-3 informants present). The data thus include interviews with around 80 persons. The data collection is still ongoing and will be completed by June 2017.

The ‘focal service system’ in the study, consist of municipal services offering language training, vocational training and various settlement services. The data collection departs from this focal service system, and cover interviews with managers, middle managers and frontline employees within these services in all three municipalities. The focal system interacts with and relies on various systems of actors in the broader service ecosystem: Private and public actors providing employment and welfare services, education authorities and services, employers, civil society, and family and social networks. The data collection also covers interviews with these intersecting systems of actors that are (potentially) included in the service ecosystem.

### 4.3. Data analysis

The analysis of the data material has been conducted in two steps:

- 1) The first step consisted of mapping the service ecosystem of each case, i.e. each municipality. The profiles were outlined based on internal documents from the municipalities and interviews with leaders and managers at each unit involved in the introduction program for newly arrived refugees. The analysis revealed that each of the three municipalities had developed different organizational and collaborative models for handling the introduction program. Thus, the service ecosystems were arranged differently (see table 1).
- 2) The next step consisted of a closer reading of the data material, and the aim was to detect the dynamics and tensions embedded in the different systems. The structuring and analysis of the interview material followed phenomenological principles. This implied extraction of condensed meaning from the different interviews, that were subsequently sorted in “themes” (Kvale & Brinkmann, 2009). The institutional logics lens was used as an analytical framework to make sense of the themes, by exploring them as expressions of different logics. The structuring of data in different logics is presented in the next section.

## 5. Empirical findings

This section presents findings which illustrate the presence of competing institutional logics at play in the service ecosystems of the three cases. We subsequently use this as a basis for answering and discussing our initial research question: *“How are the presence of competing institutional logics implicated in the making and maintenance of service ecosystems?”*

The empirical findings are structured in two main parts: First, we give an overview of how the focal service system is set up; i.e. how the municipal / government services involved in the introduction program are organized, the underlying rationale of the models, and we point to strengths and weaknesses. Second, we draw on this overview in the subsequent elaborations of the service eco systems of each case.

### 5.1. Models and rationale of the focal service systems

The introduction program is organized and set up differently in Norwegian municipalities, but about the same government actors are generally involved: The adult education units (often referred to as learning centres), the employment and welfare services (known under the acronym NAV) and refugee services. The latter has in many cases been incorporated with the other units, either with NAV or the adult education unit, but it can also function as an independent service. Housing offices or service centres may be involved in housing and practical settlement issues. Different organizational models are chosen in the cases of this study. These are presented in table 1 below, and further elaborated on in the presentation of each case under 5.2.



**Table 1: Overview of the focal service systems of the cases**

|                                                 | <i>Case 1</i>                                                                                                                  | <i>Case 2</i>                                                                                                                                            | <i>Case 3</i>                                                                                                                               |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Organizational model of the focal system</i> | NAV is responsible for the program. The adult education unit “delivers” classes in social studies and language tuition to NAV. | The adult education unit is responsible for the program. Formalized agreements ensure structured collaboration between the adult education unit and NAV. | Shared responsibility for the program between NAV and the adult education unit. Settlement issues are handled by a separate service centre. |
| <i>Rationale</i>                                | Ensure access to employment and activation measures – avoid fragmentation                                                      | Avoid “clientification” - avoid fragmentation                                                                                                            | Encourage independence                                                                                                                      |
| <i>Strengths</i>                                | Ensure service continuity beyond the program                                                                                   | Ensure close integration between involved actors during the program                                                                                      | Underline the collective responsibility of integration                                                                                      |
| <i>Weakness/ Challenges</i>                     | Risk of stigmatization                                                                                                         | Risk of reducing individual autonomy                                                                                                                     | Risk of fragmentation and blurred accountabilities                                                                                          |

## 5.2. Competing logics in the service ecosystems

The analyses identified five fundamental competing logics underlying the introduction program, which play out differently in the cases. The competing logics underlying the program reflects the shifts, dilemmas and ambiguities of integration and social policies. An overview of the logics are given next, before a more thoroughly presentation of each case.

1. First, there is the “work-first” logic which has gained stronger foothold along with broader changes in social policies towards activation and conditionality (Djuve, 2011), as accounted for in section 3. The “work first” line of reasoning holds that any job is better than none, and stresses labour market integration.
2. Second, the work first logic tends to compete with the “human capital logic”, which stresses development of skills through training and education that

enable people to find suitable employment. This logic stresses more focus on education.

3. Third, there is the “place then train”- logic, which emphasize the value of providing language training through work practice at an early stage. This logic is linked to the policy pressure to develop more work-aimed programs. This logic combines two lines for reasoning: First, involvement with the Norwegian labour market at an early stage after settlement is seen beneficial and is expected to increase chances of employment after the program. Second, language training in the work place is seen more effective than traditional classroom learning especially for people with minimal education.
4. Fourth, the “place then train”-logic tends to compete with a “protection” logic which emphasize the vulnerable situation of many newly settled immigrants. Newly settled immigrants will in line with this logic need time to settle down as they often need to deal with traumatic experiences. Pressure to take part in vocational training, or language training in work places at an early stage after settlement is in this reasoning adversely.
5. Fifth, a marginal logic is the “citizenship” logic. This logic challenges the uniform focus of the work-line, and address the fact that employment is not realistic for everyone. Following this logic, there is need for integration measures which stimulate social inclusion and citizenship in a broader manner than merely through work inclusion.

These logics compete in different ways and to differing degrees within the focal service systems of the ecosystems in the cases. Differences in accentuated and downplayed logics is to some extent, linked to variations in the different organizational models in the municipalities.

Furthermore, we find that the dynamics of competing logics in the focal service system affect the municipalities' making and maintenance of a broader service ecosystem which cover (among others) vocational training agencies, employers and civil sector actors. These actors enact also various logics, which may be more or less compatible with the logics of involved government agencies. The logics of external actors placed in different sectors (private, third sector) seems to express tensions between macro level institutional orders as suggested by Friedland & Alford (1992) and Thornton et al., (2012). The presence and implications of competing logics is demonstrated in the outline of each case next.

### **5.2.1. Case 1: Work first and place then train**

The case 1 municipality has chosen an organizational model in which the introduction program is placed within the employment and welfare services (NAV). The “work first” logic is somehow ingrained in this model, since NAV is strongly guided by the national work line policy. The chosen model has been under revision due to concerns that collaborative links with the adult learning unit has been too weak, possibly leading to a fragmented program. The revision ended with the conclusion to stick with the current model, and to focus on strengthening the collaborative links between NAV and the learning centre. The decision to stick with the current model was anchored in the work first logic:

*We try with this model to emphasize work from day one – from the day of settlement (...) Changing the model entails the risk that the program is removed from NAV's emphasis on developing work aimed programs, and we risk to limit access to NAV's labour market expertise (Leader of the refugee department at NAV).*

The interview with NAV also revealed that they focused on finding ways to ensure that the teaching at the adult education unit *“is developed in a more “work aimed” manner”*. This statement, and the motion to ensure closer collaboration between NAV and the learning centre, indicate that the work first logic of NAV was somewhat incompatible with logics at play at the adult learning unit. Improving the relations was expressed as work in progress:

*We have reached a more shared understanding of common goals – Our teachers have gained a better understanding of the program advisers' tasks. (Leader at the learning centre).*

According to one of the teachers at the learning centre, the dissonance between the centre and NAV was allegedly based in discrepancies regarding *“what is the best learning environment for language tuition?”* and *“when are people ready for working life?”* Some teachers preferred conventional classroom teaching, and found that vocational measures should be introduced at the end of the introduction program period. These views can be seen as expressions of the “protection” logic and “human capital” logic. One teacher explained that participants cannot be placed in work aimed programs too early *“because it takes time to settle”*. Yet some teachers were eager to adopt the more “work aimed” teaching practices in line with “place then train” logic, in which various employers were included in resource integration.

The civil sector was also actively involved as resource integrators in this case. A volunteer centre supplemented the Norwegian tutoring. Participants that took part in these classes were also introduced to other activities at the volunteer centre, which gave access to broader social networks. NAV found the collaboration with the volunteering centre valuable because *“its about engaging more people that contributes in taking care of you”*.

To summarize: The “work first” and eventually the “place then train” logic is most clearly accentuated in this case. The “protection” and “human capital” logic is also present, but it is more marginal. Tensions between competing logics seems to have been negotiated in ways that enable involved actors to agree on the main directions for the introduction program, which rely on involvement of employers and volunteers in a broader service ecosystem.

### **5.2.2. Case 2: Place then train and Human capital**

The introduction program in case 2 placed at the learning centre. The centre accentuates most clearly the “place then train” logic. Refugee services is in this model incorporated in the learning centre. The refugee services were previously an independent service unit, and fully integrating the previously external unit has taken years according to informants at the learning centre. The program advisors and teachers represented different and strong opinions on how to best run the program. They disagreed among others on which laws that primarily should guide the introduction program, and then ultimately the objectives of the program. The teachers

adhered to the education Act, and the program advisors adhered to introduction Act. The leader of the refugee department explained the discrepancies as follows:

*It's about disagreements concerning at what time participants are ready for internships with employers, whether you first have to learn Norwegian and then you take part in work practice, or whether it might be possible to do this the other way around.*

This quote expresses that employees in the different departments adhere to different logics: The “place then train” logic is most active in the refugee department, and the teachers adhere to mix of the protection logic and the human capital logic. Employees at the different departments have eventually started to reach more converging views on how the program should be carried out. This came as a result from lengthy negotiations and various incentive to improve collaborative relations. Moreover, dividing the program in work-directed and school-directed classes depending on participants’ background and future plans have contributed to this reconciliation. The municipality has based on this developed an introduction program, that actively enact the “place then train” logic which involves a wide range of employers in resource integration.

The employment and welfare services (NAV) have seemingly a more sidelined role in the actual program in this case. However, continues interaction and meetings based on formal collaborative agreements between NAV and the learning centre seems to ensure that NAV take part as a central service system in the ecosystem. Yet, these collaborative links have also required negotiations and gradual adjustments. The NAV leader explained that they have gradually reached mutual understandings of the programs’ objective:

*Now we have reached mutual understandings because the leader of the learning centre has been attentive. Teaching Norwegian is part of the introduction program, but the objective is financial independence- Norwegian skills in itself do not provide employment*

NAV accentuate the “work first” logic but find this aligned with the “place then train” logic most clearly pursued by the learning centre. This enable the two units to develop continuity in training and qualification of participants that need access to measures and benefits from NAV after the program period. NAV is involved at early stage when the participants start the introduction program, which opens for “new ways of thinking regarding continuity in training and qualification”.

Civil sector actors also contribute in the introduction program in this case. Some activities conducted by non-governmental organizations (NGOs) are integrated in the program but the learning centre also initiates contact with NGOs which provide activities beyond the regular program.

To summarize: The “place then train” logic, has come to dominate the development of the introduction program in this case. The protection and human capital logics are also present but somewhat downplayed, or rather, the human capital logic has been ingrained with the “place then train” logic. NAV enacts most strongly the “work first” logic, but this converge with the logics accentuated at the learning centre. We find that negotiations of competing logics also in this case have enabled the municipality

to make and maintain a service ecosystem which engage various actors as resource integrators.

### 5.2.3. Case 3: Citizenship and Place then train

The case 3 municipality has placed the introduction program within the employment and welfare services (NAV), which makes the organizational model similar to case 1. However, NAV has in this case shared responsibility for the program with the adult education centre, which makes the two models distinct. The adult learning centre is responsible for Norwegian tutoring and social science classes, NAV is responsible for the other parts of the program; i.e. general follow-up, vocational training, administering introduction benefits etc. A municipal service centre is responsible for housing and other settlement issues.

Even though three different units share responsibility for the program, there is no formal agreements that regulate the relations between the units. This seems to create a fragmented model in which responsibilities have not been clearly defined. The model of case 3 differs in this regard clearly from case 1 and 2. Yet this model also enacts a specific logic, namely what we refer to as the citizenship logic. The leader of the adult learning centre explained the reasoning underpinning the model as follows:

*The model follows this basic idea that refugee settlement concerns the whole municipality, it is not just the responsibility of one specific agency or unit. Refugees are settled in the community in the same way as any other citizen, and they relate to public services like others.*

The NAV leader also justified the model with similar terms: *“The reason for following the chosen model is based in an idea that refugees should be treated as any other citizen, they need to relate to public services in the same way as other citizens”*. By following the citizenship logic, the chosen model makes sense because it entails ideas of social inclusion and participation more broadly compared to logics merely focusing on work inclusion. The model itself is seen to enable independence and autonomy by encouraging refugees to relate to the functioning of the Norwegian welfare state model in the same way as other citizens. While the logic underpinning the model was accepted by the units involved in the program, the actors also questioned the validity of the model:

*The chosen model, which implies that refugees are treated as “regular” citizens might be good, but there is also a downside. Refugees are in a way special, and maybe they should be allowed to be treated that way for a while... (leader of the adult education centre)*

The NAV leader also suggested that the model was somewhat outdated: *With enhanced pressure due to increased immigration and settlements, we need to reconsider whether model is still relevant*. These concerns expressed that the model was apt for revisions. The presence of competing logics at play among the involved actors came the fore when discussing the options for revised models. The NAV leader explained for instance:

*We have a different agenda, we are required to ensure financial independence, while they (the adult education centre) – they are in the classroom and they have more the role as helpers (...) we feel in a way that they are holding back; when are they ready to take the language test, when are they ready to try out work practice.*

This quote expresses that NAV is more anchored in the “work first” logic, and the adult education centre adhere more to the “protection” logic. In spite of these underlying differences, the municipality moved in a direction of a model that accentuated the “place then train” logic. The emergence of more converging views was among others expressed by the leader at the adult education centre: “*They focus more on the practical stuff at NAV, while we focus on school and teaching. But we realize that it is good to focus on work.*” In line with the “place then train” logic a pilot project was initiated, which was based on early placement with employers enabling language training through work practice. The pilot was based in cleaning services and the employers were actively involved and contributed as resource integrators throughout the qualification period. The pilot was used as a basis for developing the introduction program in line with the “place then train” logic. This implied that a broader set of employers from different sectors and industries were engaged to participate as resource integrators at an earlier stage of the program. This included also the municipality as employer, which contributed with spaces for work placement in different departments.

Three civil sector actors were involved in the program. They contributed with extra language tutoring, and provided language training and social networking through trekking and outdoor activities.

To summarize: The case 3 model was initially mainly anchored in the “citizenship” logic, in which various societal actors inevitably are expected to contribute as resource integrators to ensure social inclusion. However, the involved actors in the introduction program found that the model was somewhat outdated and failed to work as intended. The involved actors mobilized in a new direction for the introduction program, which largely enacted the “place then train” logic. This expanded the service ecosystem, thus a larger set of actors were mobilized as a resource integrators.

## 6. Concluding Discussion

The paper follows up on previous research pointing to fruitful connections between the service ecosystem perspective on value cocreation, and institutional logic theory (Edvardsson et al., 2014; Vargo & Lusch, 2016). However, contrary to previous research we point to the need to focus on the competing institutional logics at play among actors in service ecosystems. Service ecosystems have been defined as systems bound together by shared institutional logics (Vargo & Lusch, 2016). We find rather that service ecosystems are embedded in competing institutional logics, and addressing the co-existence and negotiations of competing logics may give access to enhanced understandings of vulnerability and viability of such systems. Our approach support research that perceive cocreation in service ecosystems as conflicted rather than harmonious processes (e.g. Skålén et al., 2015).

Moreover, the study brings forth the service ecosystem perspective to a non-commercial service context, in which public service organizations constitute the focal service system. Since the S-D logic perspective has been developed within marketing, it has been less applied to the public sector and non-commercial service settings. Applying the perspective in diverse empirical service contexts will contribute to sharpen and further develop the perspective. Public sector service contexts tend to be conflicted and guided by competing values and demands (van den Broek, et al 2014) and studying the cocreation of value in service ecosystems become complex.

Conceptualizing value and value cocreation become in itself more complex, and the S-D logic conception of value might not be fully suitable to capture the notion of “public value” (Alford, 2016). S-D logic state that value is always uniquely and phenomenologically determined by the beneficiary (Vargo & Lusch, 2016). In public service contexts this is a problematic point of departure since public sector organizations are not merely to cocreate private value for users, but also public value for citizens collectively. The relation between private and public value can be conflicted. This is clearly evident in regard to immigration and integration issues, even though this has not been explicitly thematised in this paper. The presence of conflicted values are still ingrained with our outline of competing institutional logics in integration measures.

Our analysis depicts in sum the complexity of service ecosystem dynamics, where various service systems based on different institutional logics interact. The paper highlights how different actors need to find ways to negotiate and harmonize competing institutional logics which in turn enable the making and maintenance of service ecosystems.

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# VALUE CREATION THROUGH EMPLOYEE BEHAVIOR AND ORGANIZATIONAL CAPABILITIES

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*This study examines what dimensions of employee behavior and organizational capabilities contribute to value creation in terms of innovation performance. The study follows quantitative approach. The results are based on a cross-section of organizations located in Finland. The results are based on 160 valid responses received among 2653 HR-professionals. The hypotheses were tested by using regression analyses. The results show a connection between employee behavior, in terms of employees' role clarity, citizenship and motivation, and innovation performance. Also, connection between organizational capabilities, namely communication and strategic capabilities, and innovation performance was found.*

## 1. Introduction

Recent innovation management research has highlighted the potential of employee behavior and organizational capabilities in the economic renewal and change process. In this study organizational capabilities refer to a firm's practices that support for example the communication and strategic objectives of the work. It has been stated that these practices can contribute to value creation of firms (cf., Aral et al., 2007; Martelo et al., 2013; Ahearne et al., 2014; Camisón and Villar-López, 2014). This can also assist creating conditions for employee behavior in terms of increased role clarity, citizenship, and motivation (e.g., Anderson et al., 2014). However, few studies have examined the impact of multiple dimensions of employee behavior and organizational capabilities on value creation. Especially impact on innovation performance require further investigation.

Using a conceptual framework of the determinants of innovation performance, this study tests the antecedent status of different dimensions of employee behavior and organizational capabilities to innovation performance. We ascribe to the view that performance is multidimensional in nature, and it is therefore advantageous to integrate different determinants of innovation performance in empirical studies. The research question is as follows: what dimensions of employee behavior and organizational capabilities are connected to innovation performance. The study follows quantitative approach. The data set was gathered from a cross-section of organizations located in Finland. Statistical analyses were conducted to trace the relationship between employee behavior, organizational capabilities, and innovation performance.

The paper is structured as follows. First, prior research, conceptual model and hypotheses are presented. The following paragraphs describe the research methodology. Next, the results are presented in terms of which dimensions of employee behavior and organizational capabilities are connected to innovation performance. This

section is followed by discussion. The final section presents conclusions for research and practice as well as limitations and suggestions for future studies.

## 2. Theoretical framework

### 2.1. Definition of key concepts

The consequences of employee behavior on performance have been studied in various contexts (e.g. Franco Santos et al., 2012). Some studies have focused on the factors that facilitate role clarity (Kauppila, 2014), whereas some studies have focused on the relationship between role stressors and job performance (e.g., Gilboa et al., 2008) or between role stressors and specific aspects of job performance, such as organizational citizenship behavior (e.g., Eatough et al., 2011). Many studies have also focused on the consequences of management control systems or strategy-making patterns on employee behavior towards the desired goals (Burnley and Widener, 2007; Cheng et al., 2007; Hall, 2008; Franco-Santos et al., 2012; Kauppila, 2014). Thus, in this study *employee behavior* is defined in terms of role clarity, citizenship and motivation (cf., Franco-Santos et al., 2012).

Role clarity can be defined to include two aspects that are goal clarity, meaning the extent to which the outcome goals and objectives of the job are clearly stated and well defined, and process clarity, meaning the extent to which the individual is certain about how to perform his or her job (Sawyer, 1992; Hall, 2008). Further, the role clarity refers to individuals beliefs about the expectations and behaviors associated with their work role (Kahn et al., 1964; Hall, 2008).

Organizational citizenship behaviors can be defined as “extra-role” behaviors (Williams and Anderson, 1991), or as behaviors above and beyond the requirements of the job (Burnley et al., 2009). It can also be seen as “individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system, and that in the aggregate promotes the effective functioning of the organization” (Organ, 1988, p. 4). The current study explores whether organizational citizenship behaviors (i.e., discretionary, extra-role behaviors aimed at the organization) will advance innovation performance (cf., Burnley et al., 2009).

Work motivation can be divided to intrinsic and extrinsic work motivation, where intrinsic motivation involves people doing an activity because they find it interesting and derive spontaneous satisfaction from the activity itself (Porter and Lawler, 1968). Extrinsic motivation, in contrast, requires an instrumentality between the activity and some separable consequences such as tangible or verbal rewards, and satisfaction comes not from the activity itself, but rather from the extrinsic consequences to which the activity leads (Porter and Lawler, 1968; Gagné and Deci, 2005). Intrinsic motivation involves behaving because the activities are interesting, and a motivation involves having no intentions for the behavior and not really knowing why one is doing it (Gagné and Deci, 2005).

Organizational capabilities include strategic capabilities that consist of for example strategy alignment, development, implementation, and review (Franco-Santos et al., 2012). These capabilities are also linked to the innovativeness and organizational learning, as well as entrepreneurship and market orientation (Henri, 2006). Commu-

nication processes at all levels of organization can also be considered as organizational capabilities (Franco-Santos et al., 2012). According to Tang (1998), communication acts as a link between the employees, and the company and its external environment. Further, proper communication infrastructure is one means that facilitate the processes of innovation development (Tang, 1998).

Innovation performance can be explained for example by a firm's external search strategies and R&D intensity (Laursen and Salter, 2006). Innovation performance can also be considered as innovation potential that consists of factors affecting the present state of innovation capability, innovation processes that are systems and activities assisting organizations to use their innovation potential and therefore enable innovations, as well as the results of innovation activities that are, for example product/service innovations, and process innovations (Saunila and Ukko, 2012). In this study, innovation performance refers to a company's ability to seek and accept innovative ideas and ways of action (Hurley and Hult, 1998).

## **2.2. Hypothesis development**

### **2.2.1. Employee behavior and innovation performance**

Based on prior literature, it can be stated that there is a wide range of determinants that affect an organization's innovation performance. These determinants include, for example, include leadership practices, employees' skills and innovation, support culture, employees' welfare, and links to strategic goals (i.e., Lawson and Samson, 2001; Bessant, 2003; Wan et al., 2005).

One of the most important sources of firm's innovation performance are the employees (i.e., Lawson and Samson, 2001; Waychal et al., 2011). Innovation is more likely in a situation where people attribute high levels of integrity, competence, reliability, loyalty, and openness to others and view others as equals. Creating this type of favorable conditions for innovation involves having employees understand their roles (Dobni, 2008). Also, Stetler and Magnusson (2015) refer role clarity as an important factor in innovation. When employees complete tasks beyond their job descriptions, i.e. perform "acts of citizenship", it contributes positively to their organization, for example, in terms of effectiveness and innovation (Dekas et al., 2013; Wojtczuk-Turek and Turek, 2016).

In addition, employees' commitment, positive attitudes and behavior, and motivation are suggested to create value to a firm (e.g., Beattie and Smith, 2010; Dixit and Nanda, 2011). People who have creativity and intrinsic motivation for their work will be favorable for creating a work environment that supports the creation of innovation (Amabile, 1997). We propose our hypotheses to be in line with existing theory, namely that employee behavior will be positively related to improved innovation performance.

H1: There is a positive relation between role clarity and innovation performance

H2: There is a positive relation between citizenship and innovation performance

H3: There is a positive relation between motivation and innovation performance

### 2.2.2. Organizational capabilities and innovation performance

Also, the organizational capabilities of a firm oriented towards innovation (e.g. Wan et al., 2005; Skarzynski and Gibson, 2008) differs from other firms regarding, for example, decision-making processes and formalization. Van Hemert et al. (2013) showed that openness towards knowledge sharing is important in reinforcing innovation. In a similar line of research, Wan et al. (2005) add communication channels, and organizational resources as important factors of innovation performance. Collaborative environment is necessary for the process of creating and transferring knowledge (Van Winkelen and Tovstiga, 2009).

The results of López-Nicolás and Meroño-Cerdán (2011) show that strategic knowledge management, which is related to the processes and infrastructures firms employ to acquire, create and share knowledge for formulating strategy and making strategic decisions, has an impact on performance. Similarly, Skarzynski and Gibson (2008) stresses that the organization need to share a common vision of innovation as well as a disciplined approach to building innovation capabilities across the organization. This includes strategy of understanding how high innovation performance is to be achieved (Lawson and Samson, 2001). In line with earlier literature, we propose the following hypotheses.

H4: There is a positive relation between communication and innovation performance

H5: There is a positive relation between strategic capabilities and innovation performance

### 2.3. Research model

To summarize, previous research has often either concentrated on the determinants of innovation performance as a one dimension without studying the relationship aspect by aspect or studying only the effects of one determinant of innovation performance. Therefore, the results of the study take one step further by investigating the relationship between multiple determinants and innovation performance. In this study classification of study variables into employee behavior and organizational capabilities is not exhaustive but is based on relevance. It is guided by previous works such as the framework by Franco-Santos et al. (2012) which proposed categories of organizational outcomes as a plausible overarching framework to guide research on the different organizational level consequences. Using that as a conceptual framework of the determinants of innovation performance, this study tests the antecedent status of different dimensions of employee behavior and organizational capabilities to innovation performance.

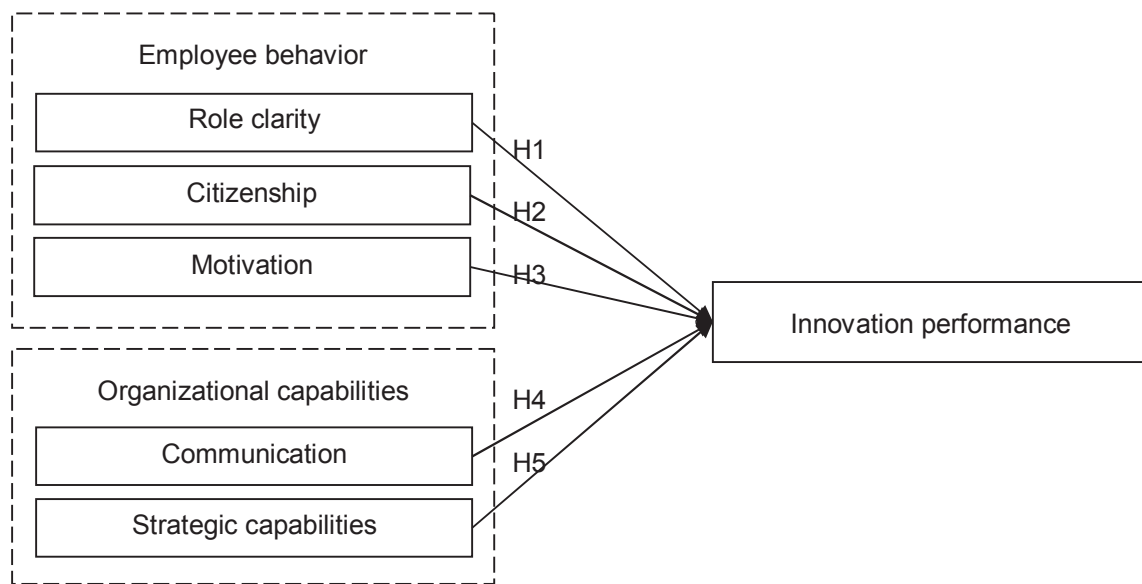


Figure 1. Research model and hypotheses

### 3. Research methodology

#### 3.1. Sampling frame and respondent demographics

The data set was gathered from a cross-section of organizations located in Finland. The initial sample was 2653 HR-professionals. After the responses were received, the data was screened. Responses were excluded if they met some of the following criteria: first, if most of the items included missing values; second, if it was clear that the responses were deliberately incorrect throughout the survey (i.e., the best possible response was selected in all the survey items); third, if there were inconsistencies in the responses. Also, responses from micro companies were excluded. This process resulted that 160 responses were valid, which equals a response rate of 6 percent.

Table 1. Background information of the respondents

|                        |                                | No  | %  |
|------------------------|--------------------------------|-----|----|
| <b>Sector</b>          | Private                        | 110 | 69 |
|                        | Public                         | 38  | 24 |
|                        | Third                          | 12  | 7  |
| <b>No of employees</b> | 10 - 49                        | 20  | 12 |
|                        | 50 - 249                       | 51  | 32 |
|                        | 250 and more                   | 89  | 56 |
| <b>Industry</b>        | Manufacturing and construction | 27  | 17 |
|                        | Retail                         | 16  | 10 |
|                        | Services                       | 25  | 16 |
|                        | ICT                            | 11  | 7  |
|                        | Banking and finances           | 17  | 10 |
|                        | Consulting/education           | 24  | 15 |
|                        | Social and health services     | 10  | 6  |
|                        | Other                          | 30  | 19 |

About 69 percent of the responses came from private sector organizations. 24 percent of the respondents represent public sector organizations and 7 percent third sector organizations. 12 percent of the respondents represented small firms with less than 50 employees. 32 percent of the responses came from medium-sized organizations and 56 percent from large organizations. The respondents represent variety of industries as presented in Table 1.

### 3.2. Variable measurement

The unit of analysis in the study is the individual respondent’s perceptions of employee behavior, organizational capabilities and innovation performance at their organization. The items were constructed based on previously utilized scales. The independent variables of the study were role clarity, citizenship, and motivation (representing employee behavior) as well as communication and strategic capabilities (representing organizational capabilities). Each of the variables was measured using two items. The dependent variable, meaning innovation performance, was measured by three items. For each of the items, the respondents were asked to indicate their opinion on a scale ranging from 1 (weak) to 4 (excellent). Two control variables—number of employees (objective), and industry (objective)—were also entered in the survey.

Table 2. Items of the survey

|                             |                                             | Item                                                                                                                                                                                            | Reference                   |
|-----------------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Employees' behavior         | Role clarity                                | Employees are aware of their responsibilities                                                                                                                                                   | Sawyer, 1992                |
|                             |                                             | Employees know the expected results of their work                                                                                                                                               |                             |
|                             | Citizenship                                 | Employees are devoted at their work                                                                                                                                                             | Williams and Anderson, 1991 |
|                             |                                             | Employees conserve organizational property well                                                                                                                                                 |                             |
| Motivation                  | Employees try to perform their best at work | Lawrence and Jordan, 2009                                                                                                                                                                       |                             |
|                             | Employees are motivated at their work       |                                                                                                                                                                                                 |                             |
| Organizational capabilities | Communication                               | Different departments work together well<br>The dissemination and exploitation of information relevant to work is excellent                                                                     | Tang, 1998                  |
|                             | Strategic capabilities                      | The connection between the functions and the strategy is clear and is implemented in practice<br>Our employees understand how the various functions (production, service, marketing) are linked | Grafton et al., 2010        |
| Innovation performance      |                                             | Our organization actively seeks innovative ideas and ways of action                                                                                                                             | Hurley and Hult, 1998       |
|                             |                                             | Our organization has an ability to renew and change ways of action when needed                                                                                                                  |                             |
|                             |                                             | Our organization has an ability to actively accept new ideas and ways of action                                                                                                                 |                             |

The validity of the variables was examined prior to hypothesis testing. Construct validity (i.e., whether the research truly measures what it intends to measure) of the scales is established by assessing content validity, and criterion validity (Hair et al., 2010). To ensure content validity, existing measurements that had been empirically tested in previous studies were used. Criterion validity was assessed through correlation analyses, which show that the constructs behave credibly. Reliability, which measures the extent to which the items in a scale represent the same phenomenon, was assessed by computing Cronbach’s Alpha (Table 3). The alpha values were greater than 0.50, which is acceptable.



## 4. Results

Table 3 presents the mean values, standard deviations, Cronbach's Alpha values and correlation matrices for the dimensions of employee behavior and organizational capabilities and innovation performance. The matrix shows significant correlations throughout between the independent variables (i.e. the dimensions of employee behavior and organizational capabilities) and the dependent variable (i.e. innovation performance).

Table 3. Descriptive statistics and intercorrelations of the variables

|                          | Mean   | Std. Dev. | Cronbach's $\alpha$ | 1       | 2       | 3       | 4       | 5       |
|--------------------------|--------|-----------|---------------------|---------|---------|---------|---------|---------|
| 1 Role clarity           | 2,9135 | ,53631    | ,831                | 1,000   |         |         |         |         |
| 2 Citizenship            | 3,2147 | ,46874    | ,560                | ,390*** | 1,000   |         |         |         |
| 3 Motivation             | 3,1186 | ,45477    | ,636                | ,216**  | ,580*** | 1,000   |         |         |
| 4 Communication          | 2,3750 | ,49391    | ,611                | ,391*** | ,308*** | ,222**  | 1,000   |         |
| 5 Strategic capabilities | 2,4615 | ,55805    | ,523                | ,561*** | ,300*** | ,315*** | ,494*** | 1,000   |
| 6 Innovation performance | 2,6474 | ,57951    | ,777                | ,384*** | ,504*** | ,430*** | ,410*** | ,367*** |

Sign. \*\*\*  $\leq 0.001$ , \*\*  $0.001 < p \leq 0.01$

The hypotheses were tested by using regression analyses. The analyses (see Table 4) show that the hypotheses are supported. The model 1 shows that the relationship between the control variables and the firm innovation performance was insignificant. Thus, it seems that the conditions such as the firm size measured in the number of employees, and the industry do not influence the firms' ability to innovate. Our model 2 for employee behavior is able to explain 35.6 percent of the variance in the innovation performance. All factors, namely role clarity, citizenship and motivation, are significant in the model. Thus, hypotheses H1, H2 and H3 were supported. The model 3 for organizational capabilities is able to explain 23.8 percent of the variance in the innovation performance. Both factors, communication and strategic capabilities, are significant in the models. Thus, hypotheses H4 and H5 were supported.

Table 4. The results of regression analyses

| Models                 | $\beta$ | SE   | St. $\beta$ | t        | R    | R <sup>2</sup> | Adj. R <sup>2</sup> | SE     | F         |
|------------------------|---------|------|-------------|----------|------|----------------|---------------------|--------|-----------|
| 1. (Constant)          | 3,125   | ,252 |             | 12,408   | ,153 | ,023           | ,011                | ,57432 | 1,889     |
| Size                   | -,116   | ,065 | -,141       | -1,789   |      |                |                     |        |           |
| Industry               | -,016   | ,017 | -,074       | -,932    |      |                |                     |        |           |
| 2. (Constant)          | -,108   | ,410 |             | -,262    | ,604 | ,365           | ,344                | ,46673 | 17,482*** |
| Size                   | ,006    | ,055 | ,008        | ,116     |      |                |                     |        |           |
| Industry               | -,031   | ,014 | -,146       | -2,197*  |      |                |                     |        |           |
| Role clarity           | ,288    | ,076 | ,267        | 3,788*** |      |                |                     |        |           |
| Citizenship            | ,354    | ,105 | ,289        | 3,364*** |      |                |                     |        |           |
| Motivation             | ,295    | ,098 | ,237        | 3,000**  |      |                |                     |        |           |
| 3. (Constant)          | 1,418   | ,348 |             | 4,073    | ,488 | ,238           | ,218                | ,51453 | 11,929*** |
| Size                   | -,047   | ,060 | -,057       | -,787    |      |                |                     |        |           |
| Industry               | -,016   | ,015 | -,074       | -1,043   |      |                |                     |        |           |
| Communication          | ,323    | ,096 | ,273        | 3,352*** |      |                |                     |        |           |
| Strategic capabilities | ,286    | ,084 | ,274        | 3,397*** |      |                |                     |        |           |

Sign. \*\*\*  $\leq 0.001$ , \*\*  $0.001 < p \leq 0.01$ , \*  $0.01 < p \leq 0.05$

## 5. Discussion

As the recent literature on innovation management has highlighted the potentials of different capabilities in the economic renewal and change processes, this research has studied what dimensions of employee behavior and organizational capabilities are connected to innovation performance. The results of the study support the presented hypotheses that were formulated in line with existing theory related to employee behavior and innovation performance (Lawson and Samson, 2001; Bessant, 2003; Wan et al., 2005) and organizational capabilities and innovation performance (Wan et al., 2005; Skarzynski and Gibson, 2008). First, it was confirmed that the higher the employees' role clarity, citizenship and motivation are, the higher is the innovation performance of a firm. This is in line with the previous research suggesting that if employees have motivation (for example Beattie and Smith, 2010; Dixit and Nanda, 2011), and they complete tasks beyond their job descriptions (for example Dekas et al., 2013; Wojtczuk-Turek and Turek, 2016) it increases innovation. The current study also suggests that employees' activity and motivated behavior play significant role when forming and improving a firm's innovation performance.

Second, in addition to employee behavior, organizational capabilities were found to be important in innovation. The results show that the more a firm invests in organization capabilities in terms of communication and strategic capabilities, the more likely it is to achieve high innovation performance. This can be due to the fact that, in order to succeed in innovation, strategy of understanding how high innovation performance is to be achieved need to exist (Lawson and Samson, 2001). Therefore, a firm should make it easy for employees to understand the firm's intentions towards higher innovation performance and to be innovative by providing tools and mechanisms to increase and support communication related to innovation and innovation activities inside the firm. The support of the communication related to firm's innovation performance also reflects to firms strategic capabilities. It supports the understanding of the common strategy of how higher innovation performance is to be achieved (Lawson and Samson, 2001) and increase the understanding of the common vision of how firm can build innovation capabilities across the organization (Skarzynski and Gibson, 2008).

The results emphasize not only the variety of organizational and human factors that determine a firm's innovation performance but also the fact that there are no remarkable differences between firms of different sizes and industries with respect to innovation performance. The results indicate that also small firms that usually do not implement large-scale innovation strategies or invest remarkably to innovation activities are able to successfully perform innovation.

## 6. Conclusions

This study has shown a connection between employee behavior, in terms of employees' role clarity, citizenship and motivation, and innovation performance. Also, connection between organizational capabilities, namely communication and strategic capabilities, and innovation performance was found. As a practical implication, these findings increase the understanding of the determinants of innovation performance and so can assist practitioners in constructing their value propositions. In addition,

the clarification of determinants assists in managing the phenomenon because they are more easily manageable than the whole phenomenon.

In terms of this study's limitations, the empirical findings only cover a specific country and may not be fully generalizable. This research is cross-sectional in nature, which is a possible limitation of the research method employed.

This study offers interesting possibilities for further studies. First, it is not clear whether or to what extent each of the dimensions of employee behavior and organizational capabilities correlates with each of the firm performance constructs (for example sustainability, productivity, and profitability). This could be a subject of future studies. Second, due to the limitation associated with the data used, further research should validate the results in firms of different regions.

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# WHEN THE SERVICE SCAPE IS THE VALUE PROPOSITION: THE CASE OF THE SWEDISH REAL ESTATE INDUSTRY

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*This paper addresses the ‘servicescape’ concept that has its antecedents in traditional services marketing that followed a goods-dominant logic. Accordingly, the servicescape addresses the physical environmental conditions (exterior, interior, and ambient conditions) that sets the scene for a service encounter, such as in an office space. We do in this paper address what happens with the servicescape concept when it is transcended into a service-dominant (S-D) logic context. For this elaboration, we connect the servicescape to aspects beyond the physical environment, encompassing corporate social responsibility (CSR); i.e., how the service contributes to the well-being of people and the environment. To contextualize this, we have carried out an ethnographic study of the Swedish real estate industry, including both focus groups and interviews. We utilize the insights from the study and build on the emergent S-D logic paradigm to construct a complementary theoretical fundament for the servicescape following the S-D logic discourse as well as incorporating CSR thinking.*

## 1. Introduction

The development of the service-dominant (S-D) logic starting with Stephen Vargo and Robert Lusch’s (2004) article, spurring a plethora of papers that address how the market functions leading to an increasing focus on the theoretical concepts of value cocreation, resource integration, and value-in-use over the last decade. However, researchers that aim at contributing to the development of S-D logic faces the risk of being trapped in the traditional goods-dominant (G-D) logic lexicon and hence only reframe the phenomena under study in new clothes (see for example early discussions in Vargo, 2007a, 2007b, 2008). The traditional marketing lexicon – what Vargo and Lusch address as following a G-D logic – is grounded in the thoughts of deliverable outputs of goods and manufacturing-based thinking with an antecedent in the era of Adam Smith (Smith, 1827); i.e., when the ‘goods’ produced was in the center of early marketing schools of thought (Sheth, Gardner, & Garrett, 1988). Thus, it focused on value-in-exchange (i.e., a value related to the output and entity that was produced and sold for money) rather than what value resources had as an input to the customers perceived value (value-in-use) whether they be material or immaterial.

Vargo and Lusch has through their writings put forth that the challenge of being with-in a paradigmatic shift<sup>1</sup> is that the current meaning of concepts has a foundation in old thinking. Sometimes a minor change can make a difference. Several journals did for example made a minor change to their names in 2016, and this also affected the American Marketing Association Services Marketing Special Interest Group that removed the plural s in services and changed its name to “American Marketing Association Service Special Interest Group.” Vargo (2007a, p. 56, emphasis as original) described the difference between the former focus on services and the new focus on service:

G-D logic sees services as (somewhat inferior to goods) *units of output*, S-D logic sees service as the *process* of doing something for another party. Value cocreation, then, moves from the firm, or “producer,” to a collaborative, co-creative process involving both parties.

To facilitate the change from a G-D logic to a S-D logic lexicon as well as the creation of new S-D logic mid-range theories they offered ‘transitional concepts,’ see Table 1 below.

**Table 1.** Conceptual transitions (Lusch & Vargo, 2006, p. 286)

| Goods-dominant logic concepts    | Transitional concepts               | Service-dominant logic concepts      |
|----------------------------------|-------------------------------------|--------------------------------------|
| Goods                            | Services                            | Service                              |
| Products                         | Offerings                           | Experiences                          |
| Feature/attribute                | Benefit                             | Solution                             |
| Value-added                      | Co-production                       | Co-creation of value                 |
| Profit maximization              | Financial engineering               | Financial feedback/learning          |
| Price                            | Value delivery                      | Value proposition                    |
| Equilibrium systems              | Dynamic systems                     | Complex adaptive systems             |
| Supply chain                     | Value-chain                         | Value-creation network/constellation |
| Promotion                        | Integrated marketing communications | Dialogue                             |
| To market<br>Product orientation | Market to<br>Market orientation     | Market with<br>Service orientation   |

What is evident is that S-D logic strongly pinpoints the context of value cocreation in a systems perspective as important, both in terms of the institutional dimensions (rules, norms and cultural/cognitive socially derived environment) and the physical environment. However, the physical environment, that is, the setting for generating and integrating resources, ‘the servicescape’ (Booms and Bitner 1981) *per se* has only received moderate interest. The concept of value is in S-D logic strongly connected to experiences and institutional arrangements and, consequently, the physical context should be incorporated in this setting. However, with few exceptions research reframing the servicescape adhering to S-D Logic is scarce. We find one conceptual contribution by Nilsson and Ballantyne (2014, p. 377) that conclude: “...the provider firm is not always able to influence the value-creation process in ways they would like, unless they recognize the underlying functional, technical, symbolic and social

<sup>1</sup> Vargo and Lusch are careful with not stating that S-D logic is a new paradigm.



dimensions which frame the meaning of any particular servicescape, and how people interact within that space.”

Consequently, as an overarching aspect of ‘doing good business’ during last decade has been the infusing of ‘doing good’ and corporate social responsibility (CSR) aspect in business, the reframing of the servicescape concept also need include social and environmental aspects beyond being a space in a location that relates to a (economic) cost. This also correspond to one of the current top-10 service research gaps – ‘well-being’ (Ostrom, Parasuraman, Bowen, Patrício, & Voss, 2015). Thus, *this study aims to update the servicescape concept so that it builds on S-D logic and hence can be part of a value-in-use oriented lexicon, incorporating the CSR dimensions*. To accomplish this, we will give a condensed description of how the servicescape has been conceptualized in current literature followed by a discussion about how real estate and building research depict the physical environmental conditions that are their equivalent with marketing research’s servicescape.

## 2. Literature review

### 2.1. A transcending perspective of the servicescape

The servicescape is traditionally described the physical environment where the service takes place and it has conceptually been described as “the exterior and interior design, ambient conditions such as temperature, noise, odour, as well as tangible parts of the service” (Reimer & Kuehn, 2005, p. 786). The topic of ‘servicescape’ (Bitner, 1992) has mainly been seen as an exogenous or basic foreground contextual factor for businesses (in e.g., retail, banks, and at hotels), being the of ‘place of business’ and the physical space that affects the customers perceived value experience. When reviewing the rather extensive servicescape literature it is evident that its research has been dominantly carried out in a consumer marketing context (it e.g., gives 38 hits when searching the top B2C journal *Journal of Consumer Research* and 5 hits in the top B2B journal *Industrial Marketing Management*).

Reviewing current G-D logic oriented research, it is evident that the servicescape can be considered a both pre, ante, and post construct and that would also be the case when it is transformed into a S-D logic construct. Prior to a value cocreation the servicescape affects the actor’s expectations – ‘what can I expect to happen in this setting?’ During the value cocreation it will support the value cocreation process and potentially also be direct involved in the value cocreation. Finally, we can also expect that the servicescape will affect how the actor reflects upon the prior value cocreation as well as potentially upcoming (and repeated) value cocreation activities. Overall, following that S-D logic has a relational approach it means incorporating the factor time which also translates well from prior servicescape research. Wakefield and Blodgett (1996) did for example study service situations where people spend a lot of time (e.g., theme parks) and how different aspects affected perceived quality. In such setting, they found full support for accessibility, facility aesthetics, and cleanliness. Seating comfort and the available electronic equipment was furthermore partly supported.

Whilst there seems to have been a prevailing interest in how the servicescape moderates the perceived service quality later studies have emphasized the social dimension of the servicescape. Harris and Ezeh (2008) did for example explore the servicescape construct related to loyalty intentions and could find evidence for that the staffs' customer orientation and physical attractiveness have an impact, but not for their credibility or competence. Either way; the people that becomes a part of the servicescape matter. Tombs and McColl-Kennedy (2003, p. 457) even come up with the 'social-servicescape concept and suggest that it "is comprised of five key elements: (1) purchase occasion (context); (2) social density (physical elements); (3) displayed emotion of others (social elements); (4) customer's affective responses (internal responses); and (5) customer's cognitive responses (either as intention of behavior or actual behaviors)."

We do in this paper adhere to this notion that the social dimension is an important one – all in line with Nilsson and Ballantyne (2014) that offered a first conceptual discussion on the servicescape from a S-D logic perspective. It does furthermore connect well to S-D logics rendering of actors as both *economic* and *social* entities (Lusch & Vargo, 2014). This furthermore opens up research avenues for including the impact of institutions and as seeing the servicescape as a part of the institutional arrangement that are necessary for value cocreation (Vargo & Lusch, 2016). Thus, our rendering connects to several current research gaps within: marketing, where S-D logic gains momentum; CSR, where the social dimension is one amongst the environmental and economic ones following triple bottom-line thinking (Elkington, 1997); and within the real estate industry where a servitization trend can be seen.

## 2.2. Real estates and facility management

For real estate and facility managers however, the servicescape do – in fact – make up the core offering. The real estate industry has traditionally been seen as a utility area which is reflected in its related scientific journals that follows econometric thinking (cf. Hardin, Liano, & Chan, 2006) rather than managerial theories. Many industries have translated their business model to be fully based on service-provision and thereby focus value-in-use following a S-D logic (Vargo & Lusch, 2016) rather than 'simply delivering outputs. Other industries have gone through the process of adding services (as add-ons to their produced output of goods) still following a G-D logic. An example of the latter is the real estate industry and facility management which has been more conservative still focusing on utility and value-in-exchange. In this logic, the servicescape is considered an operand resource that needs to be acted on in order to generate value, rather than as an operant resource, part of a resource integration process in which the customer is also engaged and, as such, influential in establishing the provider's value proposition and the customer's service experience. The servitization of the real estate industry, that is moving from a G-D logic to a S-D logic, has thereby been going slowly. For a successful outcome, the real estate firms need to adjust their focus from 'the building' to the 'space' where tenant (and their related actors) value cocreation takes place.

### 2.3. Buildings research and the missing social dimension

The engineering takes on a rather clinical approach to the study of buildings and their indoor areas. The concept of 'indoor environmental quality' is based on mainly physical factors as thermal comfort, lightings, daylight, chemical emissions and so forth. A recent study did show that these factors have an impact on peoples' cognitive functions (MacNaughtona et al., 2017). People in better air and lightning do better on tests. Other researchers pinpoint that it is the buildings that has the highest impact on the environment (e.g., greenhouse gas emissions) but that there are both technical and social transitions needed to reduce their impact on nature (Albino & Berardi, 2012). Using green certificates has been one way to gain more financial value (P. Eichholtz, Kok, & Quigley, 2010), but it has not been concluded how it relates to other values. A recent study shows that firms in the legal and financial industry leases more 'green offices' that other industries (P. M. Eichholtz, Kok, & Quigley, 2016) but that do not automatically mean that it becomes a better institutional arrangement for value cocreation.

Other building research have had a more normative stance and discussed 'smart' buildings as well as 'sustainable' buildings. There seems to be a variance in the definition of both these concepts. The smart building concepts is, however, much wider than the 'intelligent building' concept and it includes the utilization of artificial intelligence to learn about the actors' behavior and facilitate their everyday needs (Batov, 2015). Thus, the smart building concept relates to dynamic properties. The sustainability building concept are on the other hand a more static concept spanning materials, land use, well-being, etcetera. However, it has an aspect that seems more dynamic the social one – and that is also the most ignored one (Berardi, 2013). Summarizing this discussion, building research shows insights in the impact the physical environmental conditions (i.e., what we label a servicescape) have, they integrate it with CSR thinking, but they do in line with previous servicescape research have limited research on the social dimension and the operant nature of the business space.

## 3. Methodological approach

The study has an ethnographic approach (Schwartzman, 1993) and builds on engaged scholarship (Van de Ven, 2007) where the authors have carried out field studies involving participatory observations, and a series of focus group interviews (Morgan, 1997), as well as participated in different social gatherings related to the real estate industry. The study aims at including both provider (landlord) and beneficiary (tenant) perspective to result in a holistic conceptualization of the CSR dimensions that a servicescape can hold. We did also carry out the study spanning commercial tenants (B2B) and public tenants, i.e., contrasting this study to former consumer focused studies.

One of the author have spent more than four years in the real estate industry on a weekly basis and the other two years. The research has furthermore spanned over 40 interviews, 8 focus groups, as well as participant observations that has been documented (both individually and – when recorded – transcribed by a professional verbatim). The data spans well beyond 1,000 pages of single line pages of texts. The findings are based on independent thematic ongoing coding carried out by both re-

searchers and then verified by an external reviewer. Thus, it followed a consensus approach where the inconsistencies were discussed, solved, and reworked or dropped. The results of this process are presented below.

## 4. Results and discussion

Our current coding indicate six interrelated concepts related to the tenants' value co-creation and one supporting construct that are managed by the landlord and that moderates the effect of the others. The concepts are:

- 1) The building (*per se*)
- 2) Infrastructure
- 3) Well-being
- 4) Energy
- 5) Waste
- 6) Water
- 7) Communication

The concepts are interrelated as well as connected to current certificates and praxis-es. However, many of the found concepts will require the real estate industry to re-shape their value proposition and go through a servitization process, i.e., not only offering 'a building' but become a hub in the network of various tenants.

### 4.1. The Building

The fundamental element of a traditional leasing contract is the designated space in a *building per se*. However, following a S-D logic view on the servicescape – the building stays a vital element but it is rather the shadowing and embedding context of value cocreation. The symbolic aspects of being located in a house that has profile related to CSR issues is not to be underestimated. Just arriving to an inviting environment can set an actor in the right mode:

I love arriving to work when you walk in the corridors and the automatic lights switches on – you feel like a movie star!

The quotation does at a first glance confirm the traditional view on the servicescape (Bitner, 1992; Harris & Ezeh, 2008; Reimer & Kuehn, 2005) but the respondents did also add a new dimension connected to S-D logic and well-being – just knowing that the building is designed and constructed to minimize the environmental impact induces a feeling of doing good.

The building materials, its location, its integration with the surrounding community, and potentially its environmental certificates all adds to the actors' well-being. One focus group respondent did e.g., describe that they had their main office in an environmentally designed building made out of wood and that his employees felt 'proud'

of being located there. Thus, the building seems to be a central cue of what to expect and hence being a part of the CSR-oriented S-D logic view on servicescape.

## 4.2. Infrastructure

The servicescape is also an area of value cocreation interlinked with other areas of value cocreation in a larger service ecosystem. Thus, the *infrastructure* such as, communal transportations, leisure areas or state of the art internet connections can be recognized as part of the servicescape (and consequently the landlords value proposition). For example, fiber-optic internet connections enable companies (tenants) to have meetings and conferences using digital communications, thus, reducing the need for air travel and transportations. This might spur an eco-friendly mind-set of other tenants in the building and as a result the internet connection becomes more than a physical add-on service. Instead it influences a norm and praxis in which the servicescape not only provides the opportunity to do do, it also affects the way business is conducted in accordance to a CSR issues. This corresponds well to Nilsson and Ballantyne (2014) that argue for the virtual and digital dimension when transforming the servicescape concept to follow S-D logic.

Getting to the place where value cocreation shall take place is another vital dimension – something is in line with prior G-D logic studies as Wakefield and Blodgett (1996) that confirmed ‘accessibility’ as a part of the servicescape. This might include public transportation, parking spaces, areas for parts deliveries, as well as waste removal. Given that the respondents also covered tenants and landlords from the more expensive locations of central Stockholm we got descriptions of bike parking problems that was related to very expensive bikes. Having a special bike is a status thing in the financial district, and these bikes cannot be parked at ordinary bike parking’s (they would be stolen). They need garages like cars – i.e., very expensive solutions for the landlord that might have a hard time adding such costs to the leasing contract.

## 4.3. Well-being

Last but not least are the tenants striving for *well-being*, i.e., a balance in the everyday live as well as their inclination to form relationships with both the landlord and other tenants. tenants expressed an interest in having an inclusive surrounding with green spaces and different kind of services. However, they did also express the problem with tenants that have a less sustainable approach to things and that it can be disturbing if you are striving to uphold a good environment whilst others are littering and damaging the surrounding. The well-being factor is also the single aspect are closest related to the social dimension of CSR and it corresponds to current service gaps (Ostrom et al., 2015). Belongingness, inclusiveness, fairness, and awareness are all aspects that respondents stressed. Overall, moving towards a S-D logic definition of the servicescape is setting the value cocreation process in a sustainable setting.

Landlords described that contributing to the tenants’ well-being was something that would grow. One such indication was the recently developed WELL certification. No Swedish firm have gone through this certification yet, but some firms are planning for it. The WELL certificate is managed by the International WELL Building Institute and

they describe that “WELL fosters a holistic formula for better health and wellness outcomes, leading to improvements in things like employee productivity, engagement and retention.” (see [www.wellcertified.com](http://www.wellcertified.com)) The WELL certificate is related to air (e.g. filtering, control, humidity), water (e.g., quality, treatment, promotion), nourishment (e.g., vegetables, food, mindful eating), light (e.g., lightning, glare, color), fitness (e.g., stairs, activities, and external active design), comfort (e.g., accessibility, ergonomics, thermal conditions), and mind (e.g., health, beauty, and family support). Thus, it is a rather broad certificate that indicates that the real estate industry aspires to take a more active part in – and have a larger influence in – the tenants value cocreation processes.

#### 4.4. Dispersed resources

The respondents did also indicate a high awareness of the complementary recourses that a servicescape requires but that are abstract or less visible to the actors that engage in the servicescape’s value cocreation. These where energy, waste, and water. Whilst value cocreation and S-D logic aspires to get away for the linear thinking of traditional G-D logic thinking and hence contribute to circular thinking, other resources are unfortunately harder to transform, i.e., these resources are from a tenant land landlord perspective dispersed (but potentially used for other value cocreation in the wider service ecosystem).

The first concept that respondents come to think about is *energy* (electricity, heating, and cooling). This is stated in the second law of thermodynamics “In a natural thermodynamic process, the sum of the entropies of the interacting thermodynamic systems increases.” Basically, it is related to energy where more valuable forms of energy (electricity) will move towards stages of less valuable forms of energy (heat). Tenants do understand that – even if concepts as kWh/hour are being rather abstract to the everyday user – energy is a resource to handle with care. This, informative screens, knowing that the building is a low-consuming building, and working with equipment that consumes less energy adds to their feeling of well-being.

The same goes for *waste* – the basic human everyday needs will create waste and so will potentially also the ongoing value cocreation. A basic request was having recycle bins throughout the facility and more advanced ones included getting different fractions of waste weighted and reported. This could even be considered as a part of some tenants’ value cocreation as retail chains within the clothing industry; they could even get paid for their waste. Finally, the most CSR oriented respondents described that they would like to decrease the waste of office supplies and inventories and create systems for a full circular economy (i.e., being able to borrow equipment and parts of the facility from other tenants or giving office furniture that are not used to other tenants).

The third dispersed resource is *water*. The respondents pinpointed that there is an awareness that this is a vital and under-valued resource that needs to be brought into the agenda when considering the use of a building and hence the servicescape. Water is both used for consumption, but also part of hygiene, and in value cocreation processes. A basic example of its use in value cocreation is in a workshop where tenants described that they appreciated having access to both cool and carbonized water. The water issue was even more critical from the landlord perspective; with the increased density of houses within cities the risk for flooding and back-pressure in

toilets has become an issue. Governmental representatives carried out calculations to estimate the effects of '30-year' and '100-year' floods – i.e., extreme weather and floods that has the 1% respectively 3,33% risk of happening every year. Such floods would in some cases make the building unusable and the servicescape would thereby disappear and thereby potentially completely stop the possibility value cocreation.

#### 4.5. Communication

The final concept *communication* is including the tenant but it has throughout the study come out as a moderating factor that is controlled by the landlord. The former concepts of the building, infrastructure, well-being, and disperse resources (energy, waste, and water) has all been focused on entities that make up the tenant and its related actors value cocreation. However, much of the qualities of the servicescape needs to be pointed to, described, or emphasized and that has throughout the study been indicated as mainly connected to the landlord. Buildings and their external and internal environments do not always have the design or due cues that are needed for getting the tenants appreciation. Nor do the tenants always have the knowledge to understand how to utilize, or to appreciate, all the facets of the servicescape. Establishing a frequent and strong communication between the landlord and the tenant facilitates this process. It was also noted that communication not only relates to sending and receiving information, nor does it only relate to various interactions. The communication aspects are as much related to the use of symbolic and nudging social dimensions which shapes and are by shaped by the regulative, normative and culturally/cognitive institutional arrangements of the actors.

### 5. Preliminary conclusions

We have in our study applied a S-D logic perspective and explored the potential of enhancing the servicescape (i.e., the facilities that are leased) as a value proposition to be considered an operant resource and input for the cocreation of value. We have especially explored the opportunity for, and the tenants' view on, if and how the servicescape can contribute to value cocreation in the domain of CSR, adding a institutional dimension for both landlords and tenants to explore. This means looking beyond the servicescape as a value proposition consisting of just the four walls and roof of a physical environment (e.g., an office, warehouse, or a store). We specifically address the servicescape dimensions tenants consider when evaluating the landlord's CSR value proposition in relation to their own value cocreation potential. In doing so the networked nature of CSR and a system view of business is found to offer great opportunities. Transcending sustainability initiatives from just 'doing good' to becoming a foundation for 'doing good business' does however need a shift towards a S-D logic of business. Findings from this novel study suggests that this entails focusing on the servicescape as an input for the tenants and their customers' value cocreating activities.

The study indicates six central aspects that impact the tenant's view on a CSR-oriented servicescape and one moderating factor that together constitutes a S-D logic of the core value proposition for facility management and renting business premises. Findings indicate a potential direction how the real estate industry can reframe the meaning of the servicescape as a sustainability-oriented value proposition, following a S-D logic. The study has implications for the real estate industry and it also provide implications for how commercial tenants can engage in the business relations with their landlords beyond the aspect of just accessing the physical space. Presented as a first step for a new understanding of the unexploited potential of the servicescape, the study opens up avenues for a revised conceptual and business practice view of the operant nature of the servicescape and CSR in value propositions.

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