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Global Strategy and Practice of E–Governance:
Examples from Around the World

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Chapter 25
E-Government Clusters: From Framework to Implementation

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ABSTRACT
The concept of industrial clusters has received much attention in the literature over the past few decades and many examples of clusters exist today in a variety of industries, from manufacturing to services. Within such clusters, competitive cost and innovation advantages are generated through co-location. Very recently several examples of e-government clusters have emerged. This chapter offers a conceptualization of what an e-government cluster is, and how it may be different from other industrial clusters. This chapter is an attempt to formulate a framework for e-government clusters and bring out the necessary conditions for policy decisions to support the creation of such a cluster. An attempt has also been made to validate the proposed framework on the basis of case studies and to derive some recommendations to sustain the operation of e-government clusters.

INTRODUCTION
Information and Communication Technologies (ICTs) are increasingly being used in government as indispensable tools, in an effort to transform them into efficient, effective, transparent and reliable organizations at national, regional and local levels. Electronic government (e-Government) has been defined as the application of ICTs in transforming the internal and external relationships of governments [UN World Public Sector Report 2003]. While many governments across the world have implemented e-government projects, many have failed to live up to expectations due to the design-reality gaps, which were often not considered during the planning stages (Heeks, 2001).

Since e-government is as much about government as about electronic (‘e’) (Riley, 2002),

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its implementation is likely to involve active and shared participation of several players from private, public and social sectors. Often, governments face a shortage of the right expertise, right technologies and right solutions to successfully implement e-Government projects. This situation is similar to that faced by most industries during their initial stages, especially when they set-up in new locations or regions. Subsequently, the availability of right skills and technologies improves with several firms joining the region resulting in the formation of clusters.

The concept of industrial clusters has received much attention in the literature over the past few decades and many examples of clusters exist today in a variety of industries, from manufacturing to services (Porter, 1990). Recently, several projects have seen the light of day under the heading of “e-Government clusters”. Examples of these include the e-Government cluster in Hungary, Ubiquitous IT (u-IT) cluster in Korea and the GAUDI e-Government cluster of the European Union. The e-Government Cluster in Hungary has been the initiative of the private sector with active support from the Government of Hungary at local, regional and national levels. The u-IT cluster of Korea is driven by the government and primarily focuses on the development of ubiquitous technologies for the implementation of e-Government at the local level. The GAUDI e-Government cluster is the result of the PRELUDE project initiated by the European Commission under the 5th Framework Program with an aim to establish 9 European Clusters for Innovations (ECI). The GAUDI e-Government cluster is a consolidation of the Lombardy cluster of Italy, Kouvala cluster of Finland and Catalonia cluster of Spain. Unfortunately, although the concept of industrial clusters has been widely examined in the literature, no framework has yet been developed within the context of e-Government, something from which e-government clusters such as those mentioned previously might benefit. This chapter proposes to develop such a framework answering the basic question ‘What are the necessary pre-conditions for Government to support the creation of e-Government cluster?’ As a logical sequence to this question, an attempt has been made to address the question ‘What can be the likely success factors which sustain the operation of e-Government cluster?’.

Historically, different regional economies around the world had within them specialized industries operating in the form of so-called clusters. These clusters were composed of main firms, which produce industry output, and supporting firms which actively contribute to the efficient operation of the main firms. Through a mix of competition and cooperation, such firms tend to create sustainable competitive advantages within their industry and the cluster, as compared to other isolated players of the industry (Porter, 1990). Famous examples of such regional clusters include Silicon Valley of the United States, the pharmaceutical cluster centered on Basel in Switzerland, and fashion-leather cluster of Northern Italy. Such agglomeration of firms brings about improvement and innovation owing to the mutual reinforcement of cluster-based factors, subsequently leading to sustained competitive advantage. In other words, firms within such a cluster benefit from agglomeration economies with reinforced effects. The cluster becomes a vehicle for maintaining diversity and overcoming the inward focus, inertia and inflexibility that slows or blocks competitive upgrading and new entry (Porter, 1990).

It is with these advantages in mind that attempt have been made around the world to create e-Government clusters. However, it remains unclear whether the concept of cluster can be applied in the context of e-Government. Neither can one readily find a specific framework for e-Government clusters in the literature. Simply transposing the original notion of clusters, as defined by economic geographers, to the field of e-Government may not be the best way to plan or enhance such a cluster.
The most common formulation of industry clusters is probably that of Prof. Michael Porter of Harvard Business School, made famous by his 1990 book, “The Competitive Advantage of Nations”. In this chapter we adopt a similar approach, and analyze the Porter “diamond” model of clusters from the perspective of its application to the e-Government “sector”. The e-Government clusters in Hungary, Korea and EU have been critically examined through interviews, e-mail enquiries and secondary research.

The outcome of this chapter is a detailed framework on e-Government Cluster, adapted from the “diamond” model of Michael Porter, and a description of various factors to be considered when implementing e-Government clusters. Also, the importance of each factor and their role in e-Government competitiveness has been assessed. This chapter also provides insights on critical aspects of clusters which governments should carefully examine prior to its decision on supporting the creation of e-Government cluster. The validity and necessity of physical proximity of firms while forming such e-Government clusters has also been considered, given the possibilities for remote working offered by modern ICTs. The results generated not only would guide e-Government cluster investments, but also more generally the outsourcing of e-Government projects.

CLUSTERS AND E-GOVERNMENT

Clusters

Defining Clusters

Clustering, in broad generic terms, involves the grouping together of tasks or entities with similar goals and attributes. The subject of clusters is a traditional concept which is increasingly being used currently in diverse fields and areas to achieve goals in a collaborative and cooperative yet competitive environment. For example, a marketing cluster involves the segmentation of customer market based on the nature of the product, age of the customer, income level of the customer etc. Similarly, a research cluster involves the grouping of teams working on a particular subject, technology, device etc. Clusters, in general, may be categorized as marketing clusters, academic/research clusters, partnership/alliance clusters, industrial clusters, project clusters, knowledge clusters etc. With the rapid growth of information and communication technologies, online partnership clusters have seen the day in the form of online communities and online forums.

Today, the concept of industrial clusters is well known in management communities owing to the popular “diamond” cluster theory, published by Professor Michael Porter, explaining the reasons for growth or decline of competitiveness of a nation or region. The concept of industrial clusters has become so widely known in the management, research and industrial sector that the word “cluster” is quite often directly associated with the concept of industrial cluster. Prominent examples of industrial clusters include ICT cluster in Silicon Valley (USA), fashion leather cluster in Italy, wine cluster in California (USA), the forestry cluster in Finland and consumer electronics cluster in Japan.

The Formation of Clusters

It is very interesting to study the formation of clusters in various parts of the world. The forest cluster of Finland was more of a natural phenomenon owing to the ready availability of abundant and economically accessible natural resources (Rouvinen & Ylä-Anttila, 1999). The fashion leather cluster of Italy has been the result of the continued and sustained family business inheritance, whilst the consumer electronic cluster of Japan has been due more to the specific needs and wants of its citizens. Studies have shown that a strong home demand with favorable factor conditions positively influence the development of demand-related and input-oriented industries.
in a region (Porter, 1990). Furthermore, competitive advantage in the form of location becomes an important factor in determining the survival or exit of individual firms over the course of the industry life cycle (Sund, 2006).

The sustained operation of firms within clusters are said to induce the development of other firms operating in related and supporting industries, supporting the main firms producing the industry outputs. The intense rivalry among organizations in a cluster often leads to stiff competition forcing companies to enhance their product features and quality, through process improvement, technology upgrades or innovative solution deployment. The firms within the cluster tend to sub-contract their procurement and other activities to the related and supporting firms set-up within the cluster as they would be able to provide more efficient and reliable services. This would further attract firms aiming for market share in the demand for suppliers generated by the cluster.

The nature of firm strategy and structure is likely to have an influence on the competitiveness of firms within the cluster, leading to improved factor conditions and demand conditions. The companies not attempting to innovate, improve and upgrade, would gradually lose ground and disappear from the cluster.

The phenomenon of the formation of clusters is well explained by Michael Porter in his “Diamond” theory, which has the following four determinants.

- **Factor conditions**
- **Demand conditions**
- **Firm strategy, structure and rivalry**
- **Related & Supporting Industries**

The reinforcement among the determinants results in the cluster being competitive, thereby, enhancing the productivity and economic potential of the region. The Porter “diamond” is illustrated in Figure 1.

**Factor Conditions**
The factor conditions are those essential inputs accounting for the successful operation of an industry. They drive the economy of the industry and the growth of the region. They include natural resources, demographic conditions, location geography, production facilities, investment and capital potential, the presence of highly skilled and quality human resources, research infrastructure, universities present in the region, and so forth.

**Demand Conditions**
A strong home demand is usually considered a good driver to create competitiveness within the cluster and the region. The demand may be local, regional, national or even international. A strong home demand is not necessarily a question of quantity, but largely a question of the quality demanded. More demanding customers lead to better products that ultimately will be more competitive in the global market place. Thus, a sophisticated local demand is usually considered as a take-off point to stimulate the formation of clusters (Rychen & Zimmerman, 2008).

**Related and Supporting Industries**
Firms show an increased tendency to purchase from local suppliers if no compromise is seen in quality and reliability of products and services when compared to purchases from established far-off suppliers. This would induce suppliers, which are specialized in a certain field, in setting-up their base within the cluster region. Subsequently, with time, these related and supporting firms tend to become a part of the overall value chain, enhancing the drive to innovate, improve and upgrade, strengthening their competitive position.

**Firm Structure, Strategy and Rivalry**
The attractiveness of an industry may not be reliably indicated by size, rapid growth or newness of technology, but rather by industry structure. The mechanism by which companies are created,
organized and managed together with the approaches adopted by them to handle firm rivalry are known to have far-reaching and influential effect on the competitiveness of the cluster and, thereby, the economic potential of the region. It has been seen that healthy firm rivalry results in a local race to introduce new technologies, enhance productivity and lower costs.

Role of ‘Chance’ and ‘Government’

The four determinants of the cluster as illustrated above are considered by Porter as internal sources of competitiveness. He further identified the external sources of cluster competitiveness as chance and the role of government. The external sources have a potential capability to change the dynamics of cluster and, thus, reorient it in different directions.

Chance

Chance events may be considered as occurrences with less accountability to the circumstances in a nation and are often largely outside the power of firms (and often national government) to influence. Possible examples of chance are acts of nature, major technological breakthrough, drastic changes in input costs such as an oil crisis, sudden shifts in financial markets, fluctuation in national or global demand, offset of war and so forth. Innovative and sustainable leadership often becomes a key word to drive competitiveness of the cluster in cases of such chance events.

Government

Government is quite often seen as a catalyst in the case of clusters. In some instances, governments become major buyers of the products produced in a particular cluster, for example in the case of defense goods, telecommunication equipment or aircraft. More generally though, the government is seen as a facilitator to effectively support various firms in their operations with a view to enhance competitiveness of the cluster and the region. Government policies on product standards, regulations, tax, anti-trust laws, education, and so forth, are seen to greatly influence the main forces of firm structure, strategy and rivalry, demand conditions, factor conditions and the health of related and supporting industries.

Cluster Benefits

The benefits associated with clusters affect competition in three broad ways – increasing productivity, driving the pace of innovation and stimulating the creation of new businesses. A cluster allows each member to benefit as if it had greater scale or as if it had joined with others formally – without requiring it to sacrifice its flexibility. In other words, it can be said a cluster is more than just the sum of its parts. The benefits of such a cluster are listed as follows.

E-Government

Defining E-Government

The concept of electronic Government (e-Government) has been defined in several ways by...
various authors and organizations. Some of them are as follows.

Information for Development Program (InfoDev 2002)

e-Government is the use of information and communication technologies to transform government by making it more accessible, effective and accountable

Organisation for Economic Cooperation and Development (www.oecd.org)

e-Government is defined as a capacity to transform public administration through the use of ICTs

World Bank (www.web.worldbank.org)

e-Government refers to the use by government agencies of information technologies (such as Wide Area Networks, Internet, Mobile Computing) that have the ability to transform relationships with citizens, businesses and other arms of government

European Union Commission (www.europa.eu/egovernment)

e-Government is the use of ICTs in public administration combined with organizational change and new skills in order to improve public services and democratic services and strengthen support for public policies


e-Government is a government that applies ICTs to transform its internal and external relationships

Gartner Research (Gartner Group, www.gartner.com)

e-Government is the continuous optimization of government service delivery, constituency participation and governance by transforming internal and external relationships through technology, the internet and new media

Looking at the various definitions, the definition of e-Government seems to revolve around three important issues which are as follows.

1. Implementation of ICTs
2. Organizational change
3. Transformation in internal and external relationships

E-Government is thus typically seen as having a potential to optimize government processes, making them more effective and efficient. If e-Government is seen only to implement ICTs, it would be seen as an old car fitted with a new engine resulting in an inefficient and uneconomical drive. More than just the implementation of ICTs, e-Government involves the reform of government policies, relationships with various State and non-State actors, the re-engineering of operational processes, and innovation in service delivery mechanisms. Thus, the innovation involved has the power to change the relationship between levels of government and within government departments (Alberti & Bertucci 2006). ICTs need to be considered as tools to facilitate online transactions and achieve the broader goals of the government (Titah and Barki 2005). It is of course worth underlining the role of ICTs as a tool for development and not as a goal in itself (Misuraca, 2006).

E-Government Frameworks

E-Government frameworks have been designed in different ways by various organizations and institutions. Since countries vary in their political mandates, traditions, cultures, legacy systems, government working norms etc., it is a well accepted fact that one single e-Government framework may not be deemed fit universally.
This section contains some condensed examples of e-Government frameworks.

**GePeGi (Korea) E-Government Framework**
The e-Government framework designed by the Global e-Policy e-Government Institute (GePeGi), SungKyunKwan University, Seoul, Korea comprises of three factors: demand factors, supply factors and policy factors (Korea e-Government 2007). The supply factors are related to the development of ICTs and include network infrastructure, hardware infrastructure and application infrastructure. The demand factors are related to the maturity of civil society and include information management, e-capacity and economic support. The policy factors are related to the maturity of government and include IT policy, Institutional and Legal support policy and IT manpower policy.

**NISG (India) E-Government Framework**
The National Institute for Smart Government (NISG), India, is of the view that the full potential of e-Government can be realized only through a focused attention on people, process, technology and resources appropriately (Satyanaryana, J 2004), which are viewed as the four pillars of e-Government framework. The people pillar is related to the human element involved in e-Government and includes training, capacity building, change management, institution building, organization structure, governance structure, consultancy, monitoring, evaluation, awareness and communication. The process pillar is related to government workflows which need to be re-examined and includes process design and development, administrative reforms, process re-engineering, program/project management, procurement, and service levels. The technology pillar is related to the deployment of technologies in government and includes enterprise architecture, information infrastructure, standards and interoperability, security and privacy policies, identity management, biometrics, private key infrastructure and digital signatures. The resources pillar relates to the knowledge base on e-Government and includes public private partnership frameworks, service level agreement frameworks, business case analysis, mission teams, knowledge management, and user charges on services.

**Singapore E-Government Framework**
The e-Government framework designed for Singapore is based on different government interfaces with citizens (G2C), employees (G2G) and businesses (G2B). While the G2C and G2B services involve electronic service delivery as the main component, the G2G services are seen to involve knowledge management and education in information and communications (Altameem, T., Zairi, M. and Alshawi, S. 2006). The framework also suggests a strong focus on ICT infrastructure and operational efficiency in order to ensure a seamless interface and interoperability in the government interactions and transactions with employees, citizens and businesses.

Common to these three e-Government frameworks, it appears that the successful implementation of e-Government is likely to involve active collaboration among various e-Government actors, including political organizations, the public sector, business organizations, trade associations, training and research organizations, citizens and civil societies, deploying right resources at the right time and promoting productivity and innovation in government.

**E-Government Success Factors**

Many e-Government projects tend to fail owing to popular misconception of ICTs being ends rather than means (West 2007). It is important to realize the role of ICTs prior to any conceptualization of e-Government. ICTs are just a tool to provide an enabling environment to enhance efficiency and promote innovation (Misuraca, 2007). Several authors and organizations have suggested factors which account for the successful implementation of e-Government, some of which are as follows:
E-Government Clusters

- Altameem (2006): The critical success factors for e-Government can be categorized into governing factors, technical factors and organizational factors.
- Mila Gasco (2008): The key factors for the adoption of ICTs in government are political and personal leadership, strategic alignment between political strategies and IT initiatives, deployment of the encompassing institutionalization strategies, Information Technology to be a part of a more comprehensive strategy, and the management and architecture of corporate information resources.

DEFINING THE E-GOVERNMENT CLUSTER

An e-Government cluster may be defined as a ‘group of inter-related and competing firms and organizations that offer products and services in the broad area of e-Government, and derive synergistic advantages from their co-location in a given region’.

Typically, firms involved in e-Government services deliver hardware or software solutions to governments and government organizations with a view to enhance their efficiency, effectiveness, transparency, accountability and reliability (Mahapatra and Perumal 2006). Services range from the identification of system requirements, which is a pre-designing phase involving interactions and discussions with government and other stakeholders in order to identify the precise needs and requirements, all the way to servicing and advising government on the use of existing systems.

As e-Government is fast attaining the status of an industry sector in its own right, e-Government clusters can be thought of along similar lines as any other industry cluster, i.e. as a group of main firms operating in e-Government related software services and a group of supporting firms which operate in hardware, network, consultancy, training and research. As a necessary condition for an e-Government cluster to exist, strong demand from customers, in the form of government offices or agencies, need to be in close vicinity of the cluster.

The implementation of e-Government has been gaining momentum across the globe. Owing perhaps to a shortage of e-Government expertise, as compared to other IT expertise, it is often a difficult exercise for governments to identify the right partner who can conceptualize, initiate and implement e-Government projects for them. The choice of partner is often strategic in nature, and governments are sometimes seen to favor local partners. The common practice of issuing tenders or Requests-for-Proposals (RFPs), either nationally or globally, in order to select the right partner, is at times both costly and cumbersome, involving complicated pre-qualification criteria, technical criteria and commercial quote criteria.

The selection of a wrong partner in the process is seen as a potential risk, in which case governments most often have to restart the whole process once again (Jaeger, Paul, Thomson and Kim 2003). It is perhaps with this in mind that efforts have been made in certain regions to build regional competence in e-Government solutions, through the creation of clusters.
A PROPOSED FRAMEWORK

Having defined the e-Government cluster and realizing the need for productivity and innovation in government, we hereby attempt to propose a framework which can serve as a basis for understanding such clusters. The proposed framework is based on Porter “diamond” framework, which was substantiated by several clusters across various countries in the world.

Since the Porter “diamond” framework is based on manufacturing industries like hardware, wine, chemical, fashion leather, consumer electronic etc., producing ready-to-use products, an attempt has been made to extend the “diamond” framework to illustrate the dynamics of e-Government cluster. Given the specificity of e-Government as a sector, the Porter “diamond” has been extended by including more constituents with a view to present a comprehensive framework for a specialized sector like e-Government.

As it is believed that favorable factor conditions and demand conditions are the likely initial drivers to attract organizations to establish themselves in a region, two additional “diamonds”, the factor diamond and demand diamond, have been proposed, which would facilitate in creating favorable factor conditions and demand conditions. The factor diamond and demand diamond are based on networking dynamics among various e-Government actors. The proposed e-Government cluster framework is therefore a combination of three diamonds, the main diamond, the demand diamond and the factor diamond. The main diamond is the original “diamond” as suggested by Porter and serves as a parent framework for the other two diamonds.

The demand diamond is a framework involving various actors, whose active collaboration and cooperation is likely to generate favorable e-Government demand conditions. Unlike other industrial clusters where demand is mostly driven by the end user, the demand for e-Government is initially driven by the Government and its various agencies and organizations.

The factor diamond is a framework involving various actors, whose relationship with each other is likely to create favorable e-Government factor conditions. Unlike other industrial clusters where factor conditions are more focused on the availability of raw materials, transport infrastructure and so forth, the factor conditions for an e-Government cluster specifically include the availability of skilled manpower, network and broadband services, software solutions, hardware services and other related consultancy services.

The proposed framework is illustrated in Figure 2.

Figure 2. Proposed e-Government Framework (based on Porter (1990))
Main Diamond

Demand Conditions

The demand for e-Government services is seen as a necessary condition to enable the creation of an e-Government cluster in a region. Some of the factors which facilitate in generating favorable demand conditions are as follows.

1. Commitment to the implementation of e-Government in all government departments, agencies and organizations.
2. Adherence to e-Government strategies to achieve e-Government vision and objectives.
3. Intention to deploy high quality and innovative e-Government solutions with strong focus on reliability and sustainability.
4. Focus to improve democracy through provision of technology to citizens.
5. Implementation of citizen participatory mechanisms through online feedback system, discussion forums, citizen surveys, messaging applications etc.
6. Strong political will and leadership to transform labor-intensive methodology to technology-intensive methodology.
7. Partnerships / relationships with other State and non-State actors in order to utilize their knowledge, skills and expertise.
8. Right attitude and mindset among staff and officials at all levels of the government.

Factor Conditions

The factor conditions in a location / region may be categorized into basic factors and advanced factors. The basic factor conditions include availability of raw materials, power, land etc., and the advanced factor conditions include availability of expertise, skills, data storage centers etc. Both these factors need to be critically examined prior to setting-up of e-Government cluster. Some of the aspects which result in creating favorable factor conditions are as follows.

1. Easy accessibility of the region by various modes of transport.
2. Business-friendly environment at all levels of government.
3. Presence of strong telecommunication, broadband and network infrastructure ensuring reliable communication services.
4. Availability of skilled manpower (mainly engineers) in the region.
5. Willingness of skilled personnel to work in the region.
6. Presence of reasonably priced building infrastructure with basic facilities including power, security and broadband connectivity.
7. Possible presence of high capacity server infrastructure and data storage centers.

Related and Supporting Industries

The related and supporting industries like IT hardware, telecommunication and so forth, are likely to impact the sustenance of an e-Government cluster as these firms provide value-added services to the main firms of the cluster. A major driver attracting and retaining the supporting industries would be the strong home demand for e-Government services resulting from a strong commitment to implement e-Government strategies. Firms specialized in hardware, telecom, network infrastructure, training, academics, research, knowledge management and consultancy would add value to the overall value chain of the e-Government cluster.

Firm Structure, Strategy and Rivalry

The firm structure and strategy are often key areas to incorporate necessary changes needed to strengthen competitive position in e-Government market. Also, healthy firm rivalry is seen as an important mechanism to develop the
attitude of continual improvement in delivering e-Government services. However, the presence of firm rivalry may not be seen in prominence during the initial stages of e-Government cluster formation. Subsequently, with the establishment of the e-Government cluster, firm rivalry would be seen as one of the prime factors enhancing the productivity and competitiveness among cluster members.

**Demand Diamond**

The Demand Diamond involves active relationships among four key actors of e-Government. These are the administrative bodies and public sector in general, political organizations, business bodies and trade associations and citizens and civil societies. These determinant actors and the nature of their relationship are likely to help generate sustained demand for e-Government services. Also, these relationships are likely to transform traditional-based governments into network-based governments utilizing the right skills and expertise, readily available within the network. The Demand Diamond in Figure 3 is therefore to be seen as a map of the key actors involved in forming demand for e-Government, and we would expect to see regions with strong collaboration between these actors as being more receptive to e-Government.

**Factor Diamond**

The advanced factor conditions needed for setting-up an e-Government cluster, apart from the basic factor conditions, may be categorized broadly as: ICT infrastructure, Capital infrastructure, Skilled personnel and Knowledge. The ICT infrastructure includes network infrastructure, hardware infrastructure, broadband connectivity, software facilities, data storage infrastructure, security infrastructure and other supporting components. The ICT infrastructure would be one of the influential factors attracting firms to the e-Government cluster owing to its capability in serving as a backbone supporting numerous IT-based solutions and services. The lack of basic ICT infrastructure is often seen as a hindrance in the realization of e-Government (Jaeger & Thomson, 2003).

The factor diamond of the proposed framework involves relationships among various actors involved in creating favorable factor conditions. The factor diamond is illustrated in Figure 4.

The Government through regular investment and through its e-Government projects can deploy elements like server infrastructure, network infrastructure, routing equipment and other related accessories, substantially improving the ICT infrastructure of the region (Chowdhury, Habib, Wahidul and Kushchu 2006). Likewise, the public sector contributes to the e-Government factor conditions through their strategies to implement IT solutions in their organizations. The presence of business organizations and trade associations in the region may improve basic factor conditions and some of the advanced factor conditions, which include the generation of skilled personnel and creation of knowledge societies. Training and research organizations are of course instrumental in generating skilled personnel through education, work-related training programs and research projects.
CASE STUDIES

In order to examine the proposed e-Government Cluster framework, three case studies of e-Government clusters are examined: the Korean u-IT Cluster, the Hungarian e-Government Cluster and the GAUDI e-Government Cluster. The analysis is based mostly on the secondary research data collected from various sources, although some critical data was obtained through telephone interviews with concerned authorities and officials. A brief description of each cluster is as follows.

u-IT Cluster, Seoul, South Korea

The u-IT cluster plan has been framed for fostering industries of RFID and USN, which are the core technologies for construction of u-City and the next-generation growth drivers as clearly articulated in Korea’s IT839 strategy. The u-IT cluster is planned to form an innovative cluster by attracting related leading companies and R&D centers. Furthermore, it will build a globally-competitive cluster that can continue to grow by facilitating technological innovations in the RFID and USN industries and by creating new businesses for different value chains and contribute to the formation of the IT hub in Northeast Asia. The main purpose of this master-planned cluster, which is being developed on 1,500 acres of reclaimed land along Incheon’s waterfront, is to give opportunities to many leading RFID / USN companies around the world to complete RFID / USN products in the most efficient and cost-saving way.

The Ministry of Knowledge Economy and the Incheon Metropolitan City are in charge of the project and the cluster will be formed in the knowledge and information industry complex of Songdo area. They have made investments totaling $313.7 million to establish the “World’s Best Infrastructure Facility for RFID / USN technologies” with the size of the building site amounting to 81,275 sq. mtrs. in the Incheon Free Economic Zone of Songdo from 2006 to 2010. The relevant public sectors shared the view that it was important to create a world-renowned RFID / USN industrial collective complex, encompassing research, production and services. The country believes that by establishing the u-IT cluster center, the government has sought to bridge the technological gap between Korea and other technologically advanced countries (Korea IT Times 2008).

Hungarian E-Government Cluster

The first Hungarian e-Government Cluster was founded in June 2007. It was a unique initiative and the only cluster Hungary has in e-Government, though plans are underway to create regional clusters in future. The e-Government Cluster aims to create an effective e-Government as well as to build a market by common enforcement of interests and harmonizing activities. The Cluster covers a wide spectrum with comprehensive specific competencies assuring the interaction of different views.

The cluster members include advisor companies, consultancies, universities, system integrator companies, knowledge centers, local government and alliances of towns. While members can function independently, their ability to develop synergistic relationships and cooperate in a network has enabled them to reap the benefits of working together. However, members’ first priority has
been to improve services significantly across the whole field of local government.

The managing agent of the Hungarian e-Government cluster is Albacom Zrt., which is well known for its major network and system integration projects apart from operating Hungary’s largest PC and notebook assembly plant. The company has been actively involved in several IT projects, some in part funded by the Hungarian government, and has played a significant role as an integrated IT solutions provider to local governments that are in the process of setting up their local e-Government services.

The cluster performed at least half a dozen projects and prepared proposals for more than a dozen projects. The cluster is looking forward to enter into partnerships with international firms and organizations to improve the competitiveness and productivity. The cluster will apply for an audit process to achieve “Accredited Polus Cluster” qualification. In the next 5-10 years, the cluster would be in a position to market itself on Pan-European level and possibly global level.

**GAUDI E-Government Cluster - European Cluster for Innovation**

The GAUDI e-Government cluster, which was a result of the PRELUDE project initiated by the European Commission under 5th Framework Programme with an aim to establish 9 European Clusters for Innovations (ECI), provided a critical bridge to the G2C aspects suggested by GUARANTEE and the G2B aspects of the digital economy being driven by EDEn (Zalisova 2006).

The GAUDI cluster was a consolidation of three regional clusters: Kouvala (Kymenlaakso) of Finland, Lombardy of Italy and Catalonia of Spain. The members of each regional cluster are shown in Table 1.

The activities of the cluster included the preparation of an e-Government Roadmap, e-Transaction projects, organizing the Internet Global Congress and facilitating the exchange of experiences, good practices, know-how and demonstration projects.

**ANALYSIS**

The main ‘Diamond’ as illustrated in the proposed e-Government Cluster Framework had been firmly established by Porter based on industrial clusters across various countries of the world. Since e-Government is fast attaining the status of industry sector, bearing most of the industry characteristics, the ‘main diamond’ of the proposed e-Government cluster framework has not been analyzed. The differentiating feature between e-Government clusters and industrial clusters is

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**Table 1. Regional Clusters of GAUDI Cluster**

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<tr>
<th>Kouvala Cluster</th>
<th>Lombardy Cluster</th>
<th>Catalonia Cluster</th>
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<td>• IT companies</td>
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<tr>
<td>• National Land Survey</td>
<td>• 5 Public sector special agencies</td>
<td>• 800 municipalities</td>
</tr>
<tr>
<td>• Population Register Centre</td>
<td>• CEFRIEL (Politecnico Milano)</td>
<td>• Catalan association of municipalities counties</td>
</tr>
<tr>
<td>• Helsinki University of Technology</td>
<td>• 5 municipalities and provinces associations</td>
<td>• Federation of municipalities</td>
</tr>
<tr>
<td>• Lappeenranta University of Technology</td>
<td>• 14 professional associations and enterprises associations</td>
<td>• 4 Catalan provinces</td>
</tr>
<tr>
<td>• Helsinki University of Technology</td>
<td>• Lombardy Chambers of Commerce Union</td>
<td>• Generalitat de Catalunya</td>
</tr>
<tr>
<td></td>
<td>• 4 trade-unions</td>
<td>• 4 provincial public administration bodies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 11 Catalan municipalities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 5 universities: UoC, UPC, UB, UPF, UdG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cat 365</td>
</tr>
</tbody>
</table>

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the role of demand diamond to generate demand conditions and the role of factor diamond to create favorable factor conditions. The demand diamond determinants like administrative bodies, political organizations and civil societies may not be involved for industrial clusters but are likely to have an impact for e-Government clusters. Similarly, the factor diamond determinants like the government, public sector and training organizations may not be influential for industrial clusters but are likely to have substantial contribution for e-Government clusters.

The demand diamond and factor diamond have been analyzed in perspective of the three e-Government cluster cases elaborated in the previous chapter. The Demand Diamond Analysis and Factor Diamond Analysis is an attempt to examine the proposed e-Government cluster framework in the light of real-world examples, in particular its applicability for the creation and sustenance of e-Government clusters.

It needs to be mentioned here that the relevant data on the three clusters was collected through the following mechanisms:

- Websites, publications and journals
- Interactions with concerned officials during the modules of the Executive Master in e-Governance, EPFL
- e-Mail enquiries
- Telephonic interviews

Every attempt has been made to collect as much relevant information as possible so as to achieve near-real analysis.

**Demand Diamond Analysis**

The demand diamond analysis, which has been based on the level of involvement exhibited by each demand diamond determinant in the generation of demand for e-Government, for each of the clusters, is as follows.

**u-IT Cluster, South Korea**

The ubiquitous IT Cluster at Incheon is driven by strong demand generated by the Vision 2030 of Korea, which has e-Government as one of the core driving forces, along with the u-IT strategy, IT839 strategy and u-Korea strategy. The u-IT Cluster is a key initiative of the Ministry of Knowledge Economy and the Incheon Metropolitan Authority, with relevant public sectors sharing a common view. It can be derived that the political organizations, administrative bodies and public sector had a very high level of involvement in generating demand for ubiquitous services, which in-turn are directly linked to the generation of demand for e-Government services.

Korea had been implementing ICTs as early as 1980s with the active involvement of its ICT industries. The government was instrumental in establishing basic infrastructure through 11 key e-Government projects during 2002-03 and 31 e-Government Roadmap projects during 2003-07. It is likely that the successful implementation of e-Government projects, due to the active involvement of ICT industries, associations and other research organizations, would have stimulated government to visualize achieving a ubiquitous society. Business organizations had a high involvement while generating demand for future ubiquitous technologies like RFID and USN.

The role of citizens and civil societies in generating the demand for ubiquitous services seems unclear, indicating a possible low level of involvement, except for the mention in the Vision 2030 document to understand customer’s needs and offer quality services in a timely manner.

**E-Government Cluster, Hungary**

The Government of Hungary published a document on ‘Information Society’ as early as 1999 and issued the first version of the National Information Society Strategy in 2001, which had the implementation of e-Government as one of
E-Government Clusters

The Hungarian Parliament launched the e-Parliament programme to support the modernization of Parliament. Also, the Hungarian Parliament adopted the Act of Freedom of Information by electronic means in 2005, with a goal to establish the legal environment required to create a transparent Digital State. The Hungarian Government formulated the e-Administration Development Strategy 2007-13 which contains the e-Public Administration 2010 strategy. These series of events indicate a high level of involvement from the government (administrative bodies and public sector) in generating demand for e-Government services. Also, since the politicians from various political organizations approved the formulation of e-Parliament and other ICT projects, it shows that the political organizations had considerable involvement in initiating e-Government projects.

Hungary had been implementing e-Government projects since the year 2002 with the help of local and national firms. Due to insufficient domain knowledge within government, they often ended up purchasing expensive high capacity servers and computing equipments beyond their actual needs. The government seemed to greatly benefit from the e-Government cluster as it reduced unnecessary expenditure and enabled it to have a better view of the new system. The involvement of citizens and civil societies in generating demand for e-Government services seems to be unclear, indicating a possible low level of involvement, as it was found unmentioned both in secondary research and telephonic interviews.

GAUDI E-Government Cluster

The GAUDI Cluster is a consolidation of three regional clusters (Lombardy Cluster of Italy, Kouvala Cluster of Finland and Catalonia Cluster of Spain) with IT companies, administrative bodies, universities, public sector, business associations, trade unions and other government agencies as members. Unlike the previous two clusters, the GAUDI cluster operates on partnerships among the regional clusters. The physical presence of an organization within a region was not treated as a necessary condition. The cluster had a focused objective to support, promote, contribute and lead e-Government in the European Arena, thus generating demand for e-Government. The administrative bodies and public sector are seen to have a high level of involvement in generating demand for e-Government services as they had prepared an e-Government Roadmap and submitted e-Government proposals to the European Union. The involvement of political organizations seems to be less as there was hardly any mention of such organizations, either in the literature or during telephone interviews.

The involvement of citizens and civil societies was not clearly defined while framing the objectives of the GAUDI cluster, indicating a possible low level of involvement. The only noticeable mention was in providing user-friendly personalized services and multi-channel access using advanced ICTs such as voice-enabled front-end public platforms. However, the need for citizen and civil society involvement was suggested for the 7th Framework Programme of the European Union.

The summary of the Demand Diamond Analysis is shown in Table 2, which gives the level of involvement by demand diamond determinants on each cluster.

From these case studies, it appears that citizen and civil society involvement was not necessarily a systematic feature in the planning of these e-Government clusters. This does not mean that the clusters, and the services and other results emerging from these, are not citizen-centric in themselves, but it does question our proposed framework in terms of what role citizens can realistically play in such clusters.

Factor Diamond Analysis

The factor diamond analysis below is based on the level of influence exhibited by each factor diamond
E-Government Clusters

determinant in creating favorable e-Government factor conditions, for each of the clusters.

u-IT Cluster, South Korea

The Korean government has established the basic IT infrastructure through its 11 key e-Government projects (2002-03), which in-turn helped the government to implement 31 e-Government roadmap projects. The government has planned to develop u-City infrastructure in major cities by putting in place 3 infrastructures viz., Broadband Convergence Network (BCN), Ubiquitous Sensor Network (USN) and Next-Generation Internet Protocol (IPv6). From the above, it can be deduced that the government played an important role in building the basic infrastructure. Since the State owned companies in Korea obtain direct contracts from the government, they are also believed to have a substantial role in providing IT infrastructure. Thus, the government and public sector are seen to have a high influence in creating factor conditions.

The premises to host firms in the u-IT cluster have been built by the government with rental costs reported as quite low. Facilities include convenience facilities like dormitories, dining rooms, fitness centers etc. This shows that the government and the public sector have been instrumental in providing adequate and reasonably priced capital infrastructure.

Korea reported in 200X that 77% of population had access to high-speed internet and 88% of population having mobiles. The presence of large corporates and SMEs in and around the cluster region has led to an increase in the skills and expertise of the people. It can be deduced that the business organizations have had a high influence on e-Government factor conditions.

Incheon is an hour drive from Seoul, which is host to numerous universities, training institutions and research & development organizations. These institutions have been operating since a long time and have proven to be a source of rich knowledge and experience. This aspect of readily available knowledge has induced firms to set-up their base in the u-IT cluster.

E-Government Cluster, Hungary

The Hungarian government launched the Electronic Backbone (EGB) in 2004, which is a secured government-wide communication network involving 600 organizations, in order to implement its e-Government 2005 strategy. The Hungarian government organized e-Government training courses for civil servants from 700 different offices in 2006 in order to enhance internal capacities and induce a change in their mindset. It can therefore be said that the government has played an influential role in establishing IT infrastructure and capital infrastructure in Budapest, enhancing the e-Government factor conditions and inducing the creation of e-Government cluster. The public sector seems to have a more moderate influence on e-Government factor conditions in

Table 2. Demand Diamond Analysis

<table>
<thead>
<tr>
<th>Determinants</th>
<th>u-IT Cluster South Korea</th>
<th>e-Govt. Cluster Hungary</th>
<th>GAUDI Cluster European Union</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political Organisations</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Administrative Bodies / Public Sector</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Business Organisations / Associations</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Citizens / Civil Societies</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

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E-Government Clusters

Hungary owing to the fact that very few public sector organizations actively contribute towards infrastructure development.

Business organizations were influential in setting up the e-Government cluster in Budapest. The region had numerous SMEs involved in software development, which enriched the region with skilled manpower. Also, the presence of well-reputed training institutions made the region more favorable for the setting up of the e-Government cluster. The managing agent, Albacomp Zrt., is a leader in the supply of hardware and PCs in Hungary, and could easily enter into partnerships with various other organizations in order to market e-Government solutions as Services rather than as Products. Thus, it can be deduced that private business organizations influenced in a major way to create favorable e-Government factor conditions.

GAUDI Cluster, European Union

Since the GAUDI cluster is a consolidation of three regional clusters across Europe, it was difficult to analyze how the e-Government factor conditions at European level were influenced by the factor diamond determinants. Instead, it was thought to consider a single regional cluster to conduct the factor diamond analysis. The case of the Catalonia region has been considered.

The Catalonia cluster seems to have benefited from the IT infrastructure set up by the government to implement its e-Government strategies. However, the influence of the public sector on e-Government factor conditions seems to be low. The city of Barcelona hosts Scytl, a leader in developing e-voting solutions, and other numerous consultancy organizations, internet service providers and IT based training institutions, which has resulted in creating a pool of skilled personnel in and around Barcelona. It can be deduced that business organizations have been influential in enhancing the e-Government factor conditions, especially on manpower skills, IT infrastructure and knowledge.

The Catalonia region has numerous reputed universities, which are seen as a reliable source of information and knowledge on various areas. Some of these universities have initiated programs and research initiatives related to e-Government. These universities often become training institutions for providing customized training to various types of users. The creation of CAT365, a public-private joint venture, has enabled users to secure digital signatures locally, avoiding the time and effort in applying from firms located outside Barcelona. The formation of a consortium of 800 municipalities, called Localret, is again a boon to the region as it has enabled the region to develop skills and expertise on e-Government, thereby, enhancing the skills of the people.

The summary of the Factor Diamond Analysis is shown in Table 3, which gives the estimated level of influence by factor diamond determinants on each cluster.

The above analysis suggests that in the case of the clusters studied in this paper, each of the four actors played in important role in terms of

<table>
<thead>
<tr>
<th>Determinants</th>
<th>u-IT Cluster South Korea</th>
<th>e-Govt. Cluster Hungary</th>
<th>Catalonia Cluster Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Public Sector</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Business Organisations / Associations</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Training &amp; Research Organisations</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
factors of production. This being said, while government and public sector do play a considerable role in providing basic factor conditions, their influence does not seem to be as high as business organizations in creating favorable e-Government factor conditions.

CONCLUSION

Electronic Government can be a more productive version of government in general, if it is well implemented and managed [Riley, 2003]. The concept of clusters has become widely known to induce productivity, innovation and competitiveness, which are key factors to sustaining regional economic growth and development [Porter, 1990]. Since the policies and regulations framed by government have a proven impact on cluster operations, they require being cluster-friendly and innovation-oriented. The network-based governance approach in the demand and factor diamonds of the e-Government Cluster Framework proposed in this paper, appears to be important for the success of these clusters.

Clusters often emerge and begin to grow naturally, with little role of government policies [Porter, 1998]. It is after a certain stage, that local, regional or national governments can facilitate the growth of firms within the cluster, to help them improve their competitiveness. In the case of e-Government clusters, the role of government and the importance of collaboration between various private and public partners appear much more pronounced. The internet age has seen the birth of numerous virtual organizations and virtual partnerships wherein firms collaborate and compete using online tools on the internet. Although internet facilitates the efficient exchange of information, it appears that the geographical proximity of firms cannot be avoided as this proximity facilitates the information and knowledge transfer between partners, and enhances trust and confidence within the cluster (Torre 2008).

In this paper, we have extended and adapted Porter’s (1990) cluster model to the specific case of the growing e-Government sector. In particular, we hypothesized that a specific and collaborative cluster governance model needs to be in place in order to successfully create favorable demand and factor conditions for the e-Government cluster. We then examined briefly three specific e-Government cluster initiatives to give us an indication of whether various stakeholders played an important strategic role in these clusters. Our findings suggest that this was not always the case. Given the nature of the analysis, this does not, however, confirm or disconfirm the role of these stakeholders.

In conclusion, the creation of e-Government clusters is strategic in nature as it facilitates the ready availability of domain experts, the rapid selection of partners, and prompt access to innovative technologies. The pre-conditions for the creation of e-Government clusters appear to include the level of involvement of both the demand and factor diamond stakeholders as this leads to more favorable demand and factor conditions.

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**KEY TERMS AND DEFINITIONS**

**Cluster:** a geographic concentration of interrelated businesses and institutions active in a particular industry or field.

**e-Governance:** the use of information and communication technology as a tool to achieving better governance.

**e-Government:** the application of information and communication technology solutions by the government, particularly with a view to better serving citizens.

**Framework:** the structure underlying a system.

**GAUDI:** a European cluster project launched as a consolidation of three regional clusters.

**Regional Development:** the provision of guidance, aid and institutional structures to support the socio-economic development of a geographical region.

**U-IT Cluster:** the name given to a cluster initiative sponsored by the Korean government and Incheon Metropolitan City to create infrastructure in the Songdo District (Incheon) for the development of RFID/USN technology.