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**Research Paper no. 1/00**

## SCOT in Action

**Birgit Jæger**

**Roskilde University, Denmark**

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**Research Papers from the Department of Social Sciences, Roskilde University, Denmark.**

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## Abstract

*This paper presents the results from a study called: "The Technological Development of Bornholm"[1]. It was an action-oriented study where the objectives were to find new ways to utilize information and communication technology as a tool for regional development. Based on the empirical findings in the study this paper presents some theoretical reflections. These reflections are primary based on constructivistic theories of technology, but other theoretical approaches are included as well. E.g. in the discussion about the relations between actors and structures we found it necessary to include new institutional theories.*

**Keywords:**

**Information and communication, tecknologies (ICT), regional development, contructivistic theory of technology, network, trust, timing, readiness.**

**Address for correspondence: birgit@ruc.dk**

1 The study was financed by the Danish government and carried out in co-operation between the Institute of Local Government Studies (AKF); the Research Centre of Bornholm (RCB) and the Danish Building Research Institute (SBI). It run from January, 1995 to May, 1997. The results of the study is published in Danish in: Storgaard et al., 1997b.

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**By Birgit Jæger, Roskilde University, Denmark**

## TABLE OF CONTENTS

## 1. Introduction

The Danish island Bornholm is situated in the middle of the Baltic Sea. It is an island full of nature and the only place in Denmark with rugged cliffs. The island is 587 sq km and is situated 145 km from Copenhagen, approximately 40 km south of Sweden and approximately 90 km north of Germany and Poland.

The development on Bornholm is characterized by increased difficulties for the economic life and thus increased difficulties in maintaining employment and standard of living. Part of the difficulties is related to the geographic conditions as an island. It is expensive and takes time to transport goods as well as people. Other problems are caused by a specialization of economic life which is primarily based on natural resources like fishing, farming and raw materials. Thus the approximately 45,000 inhabitants have to look for other professions to replace fishing.

To solve the local crisis the Danish Government passed the so-called Bornholmer-packet in 1993. Part of this packet was a research programme with the objectives to find new ways to utilize information and communication technology (ICT) on the island. Information and communication technology are of special interest to islands like Bornholm. The technology facilitates access to markets and information for certain types of enterprises. At the same time technology shapes the possibilities to create new kinds of employment, e.g. through telework. Finally, it becomes possible to keep some services on the island by distribution of telecommunication.

Based on the empirical experience from the case of the island of Bornholm this paper presents some theoretical reflections. The theoretical reflections are primarily based on constructivistic theories of technology. Within the last decades, the constructivistic approach has spread from one scientific discipline to another. The constructivistic approach has taken different forms in the different disciplines thus today there are very big differences in constructivistic theories in different fields. E.g. some constructivistic theories within women studies are very much inspired by the hermeneutic tradition where you regard the world as a text and every analysis becomes an analysis of the text (as discussed in: Alvesson and Sköldberg, 1994). Other constructivistic approaches (especially within the field of sociology of scientific knowledge) are, among other things, criticised for:

* leaving nature out of the analysis (I will return to this point in section 3)
* becoming pure relativism, where all kinds of scientific findings tend to become equally valid
* focussing on local contingencies with the result that macro structures in society are left out of the analysis (Murphy, 1994).

In the study of the Technological Development of Bornholm we take our point of departure within constructivistic theories developed in the field of technology studies. In this study the constructivistic theories of technology are primarily based on Wiebe Bijker's approach (which is often called the SCOT-approach: Social Construction of Technology) and on Bruno Latour's approach (which is often called the Actor-Network Approach)[2]. We will show that both the "physical" world

1 A presentation of the theories can be found in Storgaard et al., 1995 and in Jæger & Storgaard, 1997.

and the societal structures are included in the two approaches and they both play an important role in our study. We are also aware of the relativistic slide (see also Jæger, 1995), but it is our opinion that this critique is not very important when we talk about an action-orientated study like ours.

There are many differences in the two approaches, and they have developed different theoretical concepts which cannot be directly transferred from one approach to another. There are, however, also many similarities, stemming from a common urge to develop a theory explaining how technology and society interact. The reason why we have chosen to base our study on both approaches, despite on their epistemological differences, is because of the action-oriented nature of our study. We were going to create actions based on theoretical reflections, which made it possible for us to be inspired by different theories.

If one accepts that technology is socially constructed, this approach opens new ways of viewing the development of technologies. How technology is shaped, and whether or not it is applicable depends on the actors who are actually involved in the concrete process. The technology is not a given thing in itself. It will be shaped differently depending on the actors involved. If other actors had participated in the process a given technology would have looked different. In other words, it is necessary to turn our point of view from the machines to human beings.

This approach also implies that a given technology is never finished when it leaves the laboratory or the drawing board of the engineer. The succeeding actors, the manufacturers, the distributors, the users etc, they all influence the shape and use of technology. Sometime users will use technology in ways never thought of by the designers. When applying this approach, the understanding of technological development is shifted from a technical-natural science paradigm to a sociological-social science paradigm.

In the research proposal (Jæger & Storgaard, 1994) we argued that the study should try out whether the constructivistic theories of technology could be utilized in a straightforward regional development although they were developed by retrospective analyses of already made technology. On the basis of these theories the intention of the study was to change the focus from the technology itself to the actors around it. Thus, we saw our task as identifying some ideas of using ICT in new ways, pointing out the right actors and then play the role as catalysts in the process of shaping a network around the ideas. It was the aim of the study that this network building could be a driving force in a local development (Storgaard et al., 1995).

During the theoretical reflections in the study we encountered problems by solely using the constructivistic approaches. Thus, we had to include other theoretical approaches as well. E.g. in the discussion about the relations between actors and structures we found it necessary to draw upon new institutional theories.

In section two I will tell the empirical story about BITS (Bornholm IT Site). I will describe what happened, the process and the results. In the rest of the paper I will present the theoretical reflections in light of the empirical experience. In section three I will discuss how we understand technology. In section four I will discuss the concept of actor and the relationship between actor and structure. In section five the concepts of network will be discussed. The empirical experience gave rise to a

further development of this concept. Thus, we have added concepts like trust, timing, readiness and social learning. Finally, in section six I will sum up the conclusions of the reflections.

## 2. The Story about Bornholm IT Site

As already mentioned it was given from the beginning that the study had to concentrate on information and communication technology. It was part of the description of the research programme. Thus, e.g. technology for fishing and farming was excluded from the study. The next limitation in the study consisted of the selection of three business segments. Two of the selected segments are traditional business segments: tourism and the metal industries. The third segment is telework, which cuts across the traditional sectors.

The study was split up in three phases. At first a general survey in the three segments was conducted through a questionnaire. This survey gave a picture of the technological and economic conditions in the three segments and it revealed the ongoing activities in the field (Storgaard et al., 1996). In the next phase some enterprises were selected for further interviewing. In this phase the special needs and ideas of the enterprises were mapped. A lot of concrete ideas and proposals for activities became visible through these interviews (Jæger & Storgaard, 1997, part 2). Finally, in the last phase, some of the ideas were selected and elaborated in some action plans. In this phase we selected actors to carry on the ideas. At the same time technological scenarios and economic calculations were conducted to analyse the different proposals. Parallel to this, the funds of the EU were looked at with the purpose of finding somewhere to apply for grants to realise the ideas (Storgaard et al., 1997a).

Even though the study had a point of departure in ICT there were a lot of different technologies to discuss. One idea was about video technology for remote diagnostic and services for small enterprises in the metal industries. E.g. if the machinery in a fishing boat got damaged while out fishing the workshop in the harbour would be able to transmit pictures of how to repair the machine. Nevertheless, during our study the Regional Trade and Industry Development Council of Bornholm[3] started a homepage on the Internet to market the island to

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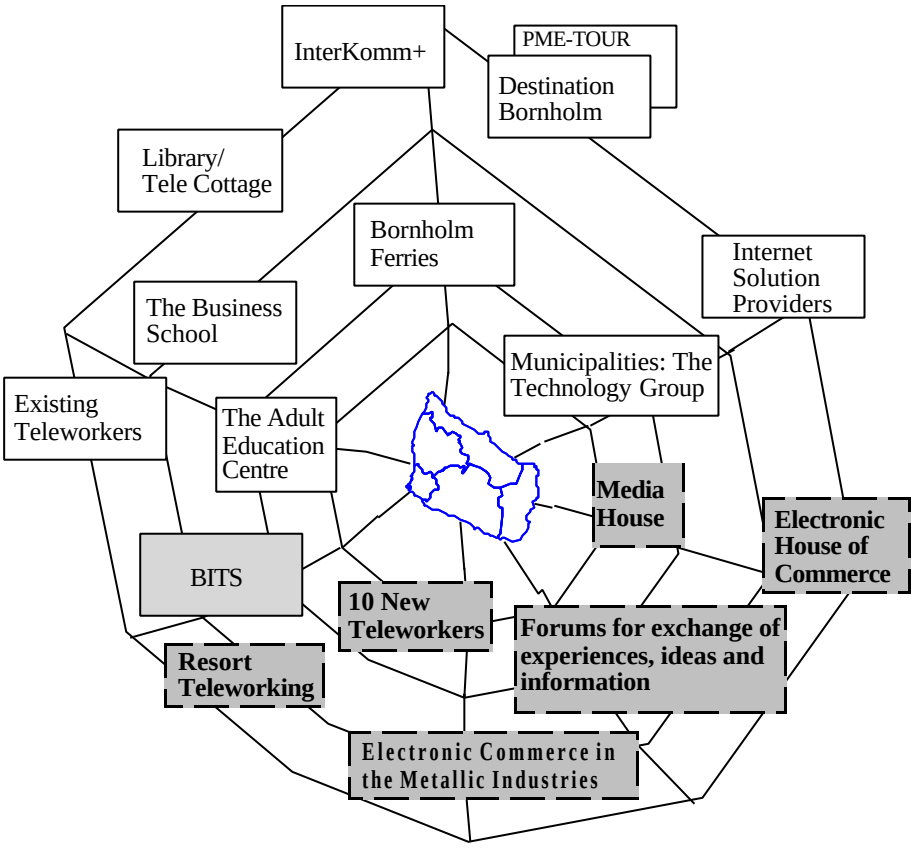
2 In a folder the council describes itself like this:
"The Trade and Industry Development Council of Bornholm was founded in 1962. It is made up of representatives from the island's business and professional life.
The Trade and Industry Development Council of Bornholm is governed by a Representatives Assembly of about 50 people with strong associations to the local society in areas such as business, politics and education.
The mission of the Trade and Industry Development Council of Bornholm is: @to be of service to companies, society and individuals by actively working to promote business development on Bornholm in a professional manner."
The mission of the Trade and Industry Development Council of Bornholm starts with the existing companies and businesses on Bornholm whilst at the same time working towards the establishment of new work places on the island.

tourists from the rest of Denmark and abroad. This homepage became the rallying point for many ideas, and inspired by this the overall result of the study turned out to be a plan of using the Internet as a tool for development for the entire island. A place for internal cooperation and a face towards the rest of the world.

The Regional Trade and Industry Development Council of Bornholm reserved one of the employees to be the driving force in the development towards the information society. He is now coordinating the activities, picking up advice from the economic and technological consultants and see to it that the actors get help to apply for grants. The idea was called Bornholm IT Site (BITS) and is illustrated in figure 1. The boxes in the figure are either ongoing projects (white background in the boxes) or planned, but not yet realized activities (grey background in the boxes). The network in between illustrates both the electronic, digital and the human network among the actors.

Figure 1. Activities in BITS



Every activity has its own story thus it will be too comprehensive to describe all of them in this paper[4]. Here I will just mention that the projects are very different from each other. E.g., the box "Internet Solution Providers" covers three single individuals who have started small enterprises where they create homepages for other enterprises, while Destination Bornholm is the overall organization of the tourism industry on Bornholm, and the telecottage at the library is part of the public service. These examples show some variety between the projects.

The important thing to understand is that BITS is not a superior structure for the entire ICT development on Bornholm. It is a place for inspiration, help for new initiatives and a coordinating function. It is a bottom-up approach where the foundation for the future development is included in all the single projects. At the same time the creation of BITS is a creation of a network where the involved actors from the other activities begin to regard themselves as part of a network. They all want to pull the development in the same direction: the creation of the information society.

Many of the projects (ongoing as well as planned) have connections outside the island. E.g. the three projects of distance education (in figure 1 they are called InterKomm+, the Business School and the Adult Education Centre) are connected to universities and other training centres in the rest of Denmark just like Destination Bornholm is linked to national and international tourism organizations. These connections are very important regarding the regional development. Contemporary theories about regional development (e.g. Malecki, 1997 or Millard, 1997) have shown that regional development is not only based on initiatives within a region it is very much depended on the connections outside the region as well.

Today we do not know exactly which of the planned activities will be realized. The study of the technological development of Bornholm is brought to an end now, and we do not know how many of the ideas that will be realized. I will return to this discussion in section five.

## 3. Sociotechnical Ensembles

In a study like the Technological Development of Bornholm it is necessary to define the concept of technology and especially to define what we mean when we talk about new technology.

In other theoretical approaches technology would probably be defined as the electronic network on Bornholm and the computers connected to it. In our study we had to take into account the personal networks between human actors as well.

3 All the activities are described in details in: Storgaard, Manniche & Hansen, 1997a.

The two networks are intertwined into each other. They cannot exist without each other and both of them were necessary in the process of building BITS.

This is an example of what Bijker calls the *sociotechnical ensemble* and Latour calls *quasi objects*. With these concepts they both want to describe the coherence between society and technology. In none of these approaches technology is defined as something outside society, both of them claim that technology is only possible to understand in context with society. That is the reason why they talk about sociotechnical ensembles and quasi objects instead of technology.

Bijker defines sociotechnical ensembles in this way:

> "Instead of technical artifacts, the unit of analysis is from now on sociotechnical ensemble. Each time 'machine' is written as shorthand for 'sociotechnical ensemble', we should, in principle, be able to sketch the (socially) constructed character of that machine. Each time 'social institution' is written as shorthand for 'sociotechnical ensemble', we should be able to spell out the technical relations which go into making that institution into a stable set-up. Society is not determined by technology, nor is technology determined by society. Both emerge as two sides of the sociotechnical coin, during the construction processes of artifacts, facts and relevant social groups." (Bijker, 1995, p. 274).

Latour started his scientific work in the field of sociology of scientific knowledge. His early work has been criticised for leaving out nature of the analysis. Murphy (1994) writes that Latour can be understood as: "A... claiming that natural science is a fictional narrative that, instead of capturing the real world of nature, produces real consequences only because people believe the fictional accounts of scientists" (op.cit. p. 968). It seems like Latour has taken this critique seriously. At least his book "We Have Never Been Modern" (1993) is a reflection on the coherence between nature and society. He begins his reflections by using a reading of a newspaper to show that many issues are a mixture of technology, science, politics, economics, legislation and religion. He calls these things quasi objects, and he argues that we have to include all these elements in our analysis, otherwise we will simplify the understanding, and we will not be able to find any appropriate solutions to the problems. He writes:

> "On page fourteen, the number of lines on high-definition television bring together Mr Delors, Thomson, the EEC, commissions on standardization, the Japanese again, and television film producers. Change the screen standard by a few lines, and billions of francs, millions of television sets, thousands of hours of film, hundreds of engineers and dozens of CEOs go down the drain." (Latour, 1993, p. 2)

In the case of Bornholm, where the subject was the use of ICT in a social setting on the island, it was necessary to use a concept of technology where both technology itself and society were included. Because of that Bijker's concept of sociotechnical ensemble and Latour's concept of quasi objects were a big

inspiration. The creation of BITS was an attempt to construct a socio-technical ensemble or a quasi object.

### 3.1. The Hardness of Technology or What is New Technology?

Both Bijker and Latour describe technological development as a process of stabilization and closure (see next section) which makes the artifact more and more obdurate for change. At a certain time it is no longer possible to change the artifact. At this stage of the process Latour says that we have a *black box*. A black box is something where you do not ask what is inside. If it is a chemical formula or a machine, you do not ask how it is built you are only interested in what goes in and what comes out.

Bijker describes closure as an "almost irreversible" process. But "On the other hand, it is in principle always possible 'although in practice very difficult' to reopen a controversy once closure is reached". (Bijker, 1995, p. 85)

For the study on Bornholm this theoretical approach leads to an understanding where it is not necessary to 'invent' new technology. To choose technology which has not yet reached the final closure opens a process where it is possible to interpret the technology on the special conditions of the island. In other words, the people of Bornholm did not have to 'invent' something new. If they adopt a technology, which is not yet a black box, and add something to it (on the basis of the local conditions of the island) you can in theory still talk about it as new technology. In many cases the result of such a process will be the development of new applications.

The idea about BITS was not very new. Other local areas (urban as well as rural) have made experiments in the same direction. However, to the inhabitants on the island of Bornholm it was new and it created new possibilities to the local economic life. With another theoretical understanding of technology we would not have suggested this idea, because we would have interpreted new technology as something just invented. Thus, the idea of BITS is an example of how a theoretical point of view is determining the concrete results of an action-oriented study.

## 4. Actors and Structures

Both constructivistic approaches take their point of departure in an actor concept, but they define actor in different ways. In the study of technological development on Bornholm we were very much inspired by Bijker's definition of actors. Bijker talks about actors as individuals, but some of the individuals are spokespersons for a group of actors who share the same interpretation of the technology in question. Such a group of actors Bijker calls a *relevant social group*. That means that Bijker's actor concept has both an individual and a collective level.

A consequence of following the development through the involved actors is that the analysis overcomes the distinction between the micro and the macro level of society. The macro level is thus described through the actors' action and attitude to the technology. This point has caused a theoretical discussion of the relationship between the actors and the structures of society where Bijker has been accused of leaving out the macro structures of society in his analysis (Jæger, 1995). This criticism originates from an understanding of societal structures as something you only find at the macro level. But as Mortensen (1991) argues (on the background of Giddens (1984)), you can find societal structures embedded at the micro level as well.

If there are no structures to constrain the actors it seems like everything is possible. It seems like there is no boundary on the meanings social groups can attribute to the technology. But that is not true. Bijker reflects the question like this:

> **"**Can relevant social groups fantasize whatever they want, without constraints? Of course, they cannot. Attributions of meaning are social processes and, as such, bound by constraints. Previous meaning attributions limit the flexibility of later ones, structures are built up, artifacts stabilized, and ensembles become more obdurate".(Bijker, 1995, p. 282).

Somewhere else he writes:

> "A theory of technical development should combine the contingency of technical development with the fact that it is structurally constrained; in other words, it must combine the strategies of actors with the structures by which they are bound." (op. cit. p. 15)

These two quotations show quite clearly that even though Bijker describes technological development through actors this does not lead to a development without any kind of limits. He is aware of the structural constraints on the actors, but Bijker stops at this point, he does not describe what kind of structural constraints the actors are limited by, neither does he describe how these constraints determine the interaction between the actors. Thus, we have to turn to other sources to get a further understanding of the relationship between actors and structures.

Mortensen (1991) reports Giddens for writing that social systems do not have structures, but they have structural characteristics. These structural characteristics Giddens calls institutionalized practice. The point is that the most important structures of society are not the public, economic, formal organizations and legalisation, but institutionalized sides of the everyday life. In other words, according to Giddens, actor and structure are not a dichotomy, but a duality. Thus one of the central concepts in Giddens' theory is "duality of structure".

When we began to focus on institutionalized practices we engaged in another theoretical discussion. Even though our point of departure is the SCOT approach it

makes sense at this point to take in new-institutional theory[5]. Scott (1995) defines institution like this:

> "Institutions consist of cognitive, normative, and regulative structures and activities that provide stability and meaning to social behaviour.... Although constructed and maintained by individual actors, institutions assume the guise of an impersonal and objective reality. Institutions ride on various conveyances and operate at multiple levels -from the world system to subunits of organizations." (Scott, 1995, p. 33-34)

March & Olsen (1989) want to explain how politics emerge. They argue that if there were no structures or constraints the world would be a completely unpredictable place and the interaction between the actors would be completely confused. The reason why this situation is not the case is that all political actions are institutionalized, thus they want to describe these political institutions and how they function.

Due to Scott's definition institutions consist of both regulative, normative and cognitive structures. March & Olsen emphasize the normative structures by virtue of that one cornerstone in their theoretical approach is that the possibilities for action are reduced by rules:

> "By "rules" we mean the routines, procedures, conventions, roles, strategies, organizational forms, and technologies around which political activity is constructed. We also mean the beliefs, paradigms, codes, cultures, and knowledge that surround, support, elaborate, and contradict those roles and routines." (March & Olsen, 1989, p. 22)

The rules can be understood as a kind of social contract: If I treat you properly I expect you to treat me properly, too. Every single individual learns the rules through education, training and socialization. Some institutions are very broad and cover rules for living in a modern western society while other institutions are more narrow and cover rules for everyday life in an organisation. This leads to the fact that the individual e.g. learn some rules about a profession through education, but when one of them is employed in a specific organization he or she learns how to practice the profession in this specific organization.

According to March & Olsen rules make life much easier. They make it possible to coordinate many simultaneous activities in a way that makes them mutually consistent. Rules help avoid conflicts, and they provide codes of meaning that facilitate interpretation of ambiguous worlds. To say that behaviour is bound by rules does not mean that most behaviours are routines. Every situation can be

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4 This theoretical field has a lot of different approaches. You can find new institutional theory within economics, sociology and political science. Scott (1995) discusses similarities and differences in the different approaches.

interpreted differently and thus it will be possible to use different rules for behaviour. The criterion for behaviour is appropriateness, but determining what is appropriate in a specific situation is a non-trivial exercise.

This way of thinking explains some of the 'dark sides' of the SCOT approach. According to the SCOT approach we have to "follow the actor" to see how he or she interprets the technology in question. The relevant social group is an analytical category where actors with the same interpretation of the technology are put together in a group. Sometimes the different individuals are not even aware of this group, it is not given that they know the other persons in the same relevant social group. But in many situations we find that the relevant social groups are similar with already existing structures and organizations in society (Bach & Johansson, 1997). It is e.g. very common to find that actors in the same company have the same interpretation of technology and therefore can be characterized as one relevant social group, just like it is very common to find actors in a governmental agency forming a relevant social group. You cannot take this for granted from the beginning of the analysis, sometimes you will find more than one relevant social group within a company or governmental agency (Jæger, 1995) other times you will find relevant social groups with actors covering a range of different organisations, but many times boarders between relevant social groups will follow boarders between organisations.

### 4.1. Actors on Bornholm

Returning to the study of the technological development of Bornholm we could use these theoretical reflexions to define actors as: individuals as well as organized collectives who participate in the discussions and reflexions around how to use ICT in new ways on the island. We did not consider the actors as free birds, but were aware of the institutionalized constraints they were carrying around. These constraints are the results of many things: the actors training, socialization, organisational affiliation, interaction with other technologies and so forth. But these institutions are not fixed, they were redefined in the process of interaction around BITS.

Figure 1 illustrates the activities in the field of ICT at Bornholm. To make the involved actors visible one could take each activity and map the actors from these projects. This mapping of actors would show a detailed picture of people involved in many activities and with a lot of interaction across the projects.

In the case of Bornholm there were several collective actors. When we spoke to the mayor of the county he represented the whole county, just as a business director was a spokesman for the entire Trade and Industry Development Council of Bornholm. But when we talked to one of the teleworkers he or she only represented him or her self. In the tourism area there are collective actors in the tourism organizations as well as there are individual actors in the individual hotels or camping sites.

The collective actors represent a network themselves. This means that you are giving much more power to your network if you manege to enroll a spokesperson

for another network than if you enroll an individual actor. Mortensen (1991) describes how a spokesperson for a collective actor has the backing of all members and resources of the collective. The collective can also give the spokesperson a mandate he has to follow in the interaction with other actors.

## 5. Network

The concept of network has been the central and superior concept in the study from the very beginning. The idea of the study was to map the already existing networks between the actors and then consciously build up new networks. I see the most important result of the study as the fact that we managed to build up a network around BITS of mostly local actors, but with important connections to actors outside the island.

At first, I will go through how the theories define the concept of network. Bijker does not use the word network. He operates with the concept *technological frame*. This concept of a technological frame is very important, because it is through this Bijker wants to catch the social dynamics between the actors. Through a process where the actors interact with each other they build up a common interpretation of technology.

> The concept 'technological frame' is intended to apply to the interactions between various actors. Thus, it is not an individual's characteristics, nor the characteristics of systems or institutions; frames are located *between* actors, not *in* actors or *above* actors." (Bijker, 1990, p. 123).

Latour is using another concept. He talks about networks of actors. Latour describes a network in this way:

> **"**Thus, technoscience may be described simultaneously as a demiurgic enterprise that multiplies the number of allies and as a rare and fragile achievement that we hear about only when all the other allies are present. If technoscience may be described as being so powerful and yet so small, so concentrated and so dilute, it means it has the characteristics of a *network*. The word network indicates that resources are concentrated in a few places **-** the knots and the nodes **-** which are connected with on another **-** the links and the mesh: these connections transform the scattered resources into a net that may seem to extend everywhere". (Latour, 1987, p. 180)

The process that constitutes a technological frame or a network Bijker describes with the concepts of *stabilization and closure*:

> "This becoming dominant of an artifact is the effect of two combined processes **-** closure and stabilization. These actually are two aspects of the same process.... Stabilization can most

> easily be introduced by analysing the *intra-group* development of artifacts, while closure is primarily relevant to an *inter-group* analysis.... Consensus among the different relevant social groups about the dominant meaning of an artifact emerges and the 'pluralism of artifacts' decreases." (Bijker, 1990. p. 93-96)

In his book "Science in Action" Latour (1987) has a very good description of the shaping of a network. He describes it as a process where "somebody" wants to build up a network. The question is to *enroll* other actors into the network and later on to *control* what they are doing to the network. Latour describes a lot of ways to do this, and he is very often using a military language where he describes it as a battle between different actors.

When the network is built we have a black box (refer to section 3.1). Latour also describes that the fight has not stopped here, you have to maintain the network around the black box, to control the actors, to shift the weak actors with stronger actors, otherwise it can break into small pieces.

### 5.1. Network on Bornholm

The idea of BITS was born during the process of the study. In the first questionnaire and the following interviews the idea emerged. At the same time the process revealed who the important actors would be for building up a network around BITS. It sounds very simple to build a network on the island of Bornholm, but it is not at all the case. Everyone taking part in the daily activities in society by making deals, negotiating with partners and so forth will probably agree in the difficulties in building up networks. Just like we all know stories about what happens if the process does not succeed. Research projects that break down on a missing funding; amalgamations between big companies (e.g. Volvo and Renault) that are wrecked in the last moment because of a member on the board of directors and so forth. If some important links in the chain are missing the whole construction of a network breaks down and many times the actors have to start from scratch.

In the process of building a network on Bornholm we did something which is quite unusual for a research team. At the very beginning of the study a reference group was formed. Here the business director of the Trade and Industry Development Council and the local manager of the telephone company were seated. During the study they became more and more involved in the process and they became active actors in the network around BITS. Also in the beginning of the study we held a press conference for the local press where we presented the study. This made the study visible on the island.

When we found key actors whom we assessed could be important actors in the network we invited them to meetings where we discussed the idea about BITS with them. We arranged a study trip to another Danish municipality (Næstved) which is running an experiment where they try to outline the shape of the information society. Finally, when we had selected the actors who were going to be the driving force in the activities, we invited all of them to a workshop. At this workshop we presented the idea of BITS and put together the actors within their different fields.

Before the end of the day everybody had agreed on the general idea and it was clear who had the responsibility for the further work.

During this process the research team had to select the actors to build the network. In former social experiments with information technology it has, due to the Danish ideals of democracy, been stressed that everybody in the local community was welcome to join the experiment. In the beginning we felt very guilty by not living up to the ideals, but it was clear that if we really wanted to build the network we had to select the actors very carefully and just as strategically as Machiavelli did when he built his empire (Latour, 1988).

At certain times during the study we used the knowledge about collective actors as more powerful actors than individuals, when we had to strengthen the network in the making. The thoughts about BITS became much more reliable when the Technology Group of the Municipalities and the County (see figure 1) joined the network, and their spokesperson declared that they wanted to support the idea. There are five municipalities and one county on Bornholm. Many times these six organizations have used their energy on internal competition and rivalry. But to be in keeping with the national strategy for forming the information society the public authorities took the initiative to create this group at about the same time as the study took off.

It was quite decisive to the building of the network around BITS that this group joined the network. Thus I will describe this action a little further. On behalf of the new institutional approach we can explain this support to the BITS network as an appropriate behaviour for a group like this. It is an appropriate behaviour because of the national strategy for the information society.

In 1994, the Danish government formed a committee with the purpose to point out the way that would lead Denmark into the information society. This committee made a report which recommended that the public sector should be a driving force in the development of the information society and promote certain Danish values:

> **"**The public sector shall be actively involved with the private one and be the leading force in the efficient use of information technology. (...) The strategy shall be based on a Danish model where market forces should not be the only forces involved. The strategy must secure some special values." (Dybkjær & Christensen, 1994)

These recommendations stressed the importance of the public sector in the development of the information society which was very unusual compared with the similar strategies from countries which Denmark usually compare itself with. The most influential strategies in this field, the Bangemann Report initiated by the European Commission and from the United States, the Clinton-Gore initiative on "The National Information Infrastructure", recommended that the market forces should be the driving force in the development (Johansson, 1997).

During 1995, the Ministry of Technology and Research followed up by making a very concrete plan for action and this Action Plan was followed up again in 1996

and 1997. These action plans created many IT related activities at many levels of society. From 1995 to 1996 there was a shift regarding focus: From many different electronic networks to focus on the Internet as the carrier of electronically mediated public service.

This initiative from the central government started a public discussion which is still going on. On this background it seems quite appropriate that a group formed to coordinate public initiatives in the ICT field joins the construction of the network around BITS.

It is not only the local authorities who take the initiative from the Danish government seriously. Also the National Association of Local Authorities in Denmark reacted on the recommendations about the leading role of the public sector. The association was looking around for a suitable area to try out some ideas. Because of the activities on Bornholm the association became aware of the island and found it suitable. Thus, the association contacted the coordinating technology group on Bornholm and asked if they were interested in participating in a project including the establishing of a common electronic network between the public authorities on the island, a network between the public schools, some training activities in using ICT, an electronic library system and some other ideas.

This is an example of how an activity built around a network can attract other actors. Even though the suggested projects are initiated by the National Association of Local Authorities in Denmark it becomes a part of the network around BITS. Or one could say that we have two networks how is sharing some important key actors and both are attending the same kind of objectives.

This cooperation between the local authorities on the island and the national association is also an example of the former mentioned important extension of the network outside the island. By enrolling the National Association of Local Authorities in the development on the island a lot of new resources are brought to the island. Hopefully, Bornholm will be able to draw on these resources in the further development.

This going through the case of Bornholm shows that it is a difficult task to build a network. The network is not finished yet and there are still a lot of difficulties to overcome. Maybe the network will crumble away over the next couple of years, but the future destiny of the network is now out of the hands of the study. It is now up to the local actors to strengthen the network or let it die.

During this practical, empirical work of selecting actors and building the network we became aware of some mechanisms which turned out to be very important. The mechanisms are: Trust among the actors, timing, readiness and social learning. In the following sections I will go through these mechanisms and explain how they worked in the empirical study and how this experience is able to sophisticate our theoretical understanding of networks.

### 5.2 Trust Among the Actors

Trust among the actors is necessary in order to build a network. In the process of maintaining the network it is also important to keep up trust among the actors. If the trust among the actors for some reason disappears the result will be a breakdown of the network. Lack of trust leads to the breakdown of existing networks and prohibits the building of new networks.

If the trust is not there from the beginning, the actors have to create it. As a research team partly coming from the capital of the country we realized that the local actors did not automatically have any trust in us. The islanders have experienced people coming from Copenhagen trying to tell them what to do. This has made them sceptical towards smart people like that. There is a strong feeling of independence on the island, probably because of the geographical circumstances. For many centuries the island had to cope on its own. Thus, the people of Bornholm are used to solving their own problems. However, we were researchers and because of that we represented some structures that people usually trust. By and large we had to convince the actors on Bornholm that we did not bring along any final solutions. Instead we wanted to generate some solutions together with the local actors.

It was obvious that when we wanted to enroll new actors in the network around BITS it was much easier to enroll them if there were actors in the network whom they trusted already. Contrary to that they did not want to support the idea if there were actors in the network whom they did not trust.

Trust is also an important concept in many other theoretical approaches. Malecki (1997) explains why the use of ICT is not always the best way to overcome geographic distances. It is e.g. not possible to replace face-to-face contact with ICT if the task is to develop new products or something like that. In such cases trust among the participants is so important that they have to meet in person. After the shaping of trust among the actors they can use ICT for a while, but from time to time they have to meet person to person to maintain their internal trust in each other.

March & Olsen (1989) also include trust as an important feature in the description of political institutions. They describe how individual actors in an organization are influenced by the opinion of the other actors they trust. In the industrial networks approach (described in Storgaard et al., 1995) trust plays a crucial role, too. It is even part of the everyday knowledge that trust is important in trade. As the Business Director of the Regional Trade and Industry Development Council of Bornholm says: “To make a deal is to make a friend”.

### 5.3. Readiness and Social Learning

The actors have to be ready to go into a new network. If the actors (individuals as well as collectives) are not ready to go into the network around technology there will be no network. Lack of readiness prohibits the building of networks. In the EU the concept ‘awareness’ has been used. In these circles it means to create an awareness of technology as a first step in a local ICT policy. First when the awareness exists it is possible to start local projects.

In the study of Bornholm we defined readiness as a phase before action. To be ready means to be ready to take off. Ready, steady, go! When one wants to create readiness among some actors it is not enough just to present the actors to the technology through the common channels for trade or the public offers for technological advice (Jensen et al., 1994). Our interviews revealed that advice from e.g. a colleague, whom the actor already trusts, is much more effective.

However, technological advice is not always enough to make the actor ready. Our study also revealed how important it is that every single actor has some knowledge about technology. Many times the actor himself has to be familiar with the technology in one way or another. It is first possible to see new ways of application technology when you have some knowledge about it and some practice of using it. This point creates a new question: If readiness is closely linked to knowledge about the technology in question, how can the actors learn to be ready? This question is of special interest if we talk about collective actors like organisations.

Learning is an issue that has been studied for many years and in many disciplines. The research stretches from physiological studies of learning as individual cognitive processes to organisational theoretical studies of learning as an organisational process (Jæger, 1994). This is a very big field which I will not describe here, but I need to clarify how we have used the concept learning in the study of the Technological Development of Bornholm.

In a process like the one described learning is a result of the interaction between the actors. When they build the network, when they conduct trust among each other they go through a process of learning. We do not see learning as something which is only taking place in a classroom. Learning is taking place when one actor influences another actor's way of thinking about technology (Björkegren, 1989). Learning is also taking place when an organisation is changing its routines, e.g. on behalf of use of technology (Levitt & March, 1988). In the case of Bornholm we prefer to talk about social learning because we want to emphasise that we are talking about learning taking place in a social setting where the actors learn by being part of the process of building a network (Elkjær, 1996)[6] .

## 5.4. Timing

It is not a universal quality of an idea whether it is good or bad. The idea will seem bad if it is presented at the "wrong" time and good if it is presented at the "right" time. As Latour (1987) has shown ideas turn out to be good if a network is built around it and turn out to be bad if there is no network around it. The possibilities to build a network is also a question of timing.

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5 This discussion is not further elaborated in the study of the Technological Development of Bornholm. Contemporary, the discussion is going on in a study named Social Learning of Multimedia, which is an EU financed study. The latter study has not yet published the results, but the author of this paper is involved in the conceptualization of learning in this study.

In the case of Bornholm it is quite clear that if the idea of BITS had been presented two years before, it would have turned out to be a bad idea. At that time nobody were ready for an idea like that and it would have seemed impossible to realize. On the contrary, it would probably also have been bad timing to present the idea of BITS in two years time. Then the actors would see the idea as something which has already been tried many other places and thus nothing new to come up with.

Many things have to be in place before the right timing is there. First of all the actors have to be ready. It is not enough that only one actor is ready there has to be more than one actor to create a network. In our empirical research we found an example of an actor who was ready to create what we in figure 1 call a Media House two years earlier. She wanted to create a place where free-lance journalists and photographers could work side by side using the same equipment. It would save the actors the expenses to buy the equipment on their own and they could probably share their experience and maybe even make common marketing. However, it was a bad timing no actor was ready to go into such a project. When the study took up her idea she herself had lost her patience, she sold her house and moved away from the island.

However, ready actors is not enough. A lot of other things have to be in place, too. In the case of Bornholm it was clearly important that the entire telephone network on the island was digitalized just before the idea of BITS was launched. It was also important that the Danish government had announced their plan for the information society and thus started a debate about the use of ICT. It was important that the county and the municipalities of the island had formed a working group to coordinate initiatives in the field of ICT. Just as it was important that other local societies had tried out ideas like the proposed ones and shown that it was possible to realize them. Bornholm would not be the very first place in Denmark to try things like this, but one of the first places. If these (and probably other) ingredients were not in place at the time we proposed the idea of BITS the idea might have turned out to fail.

## 6. Conclusion

The conclusion after these theoretical reflections on our study on the island of Bornholm is that the constructivistic approaches on technological changes served as an appropriate point of departure. It was possible to use these theoretical approaches in a straightforward regional development. The way of understanding technology gave a freedom in the process of selecting among the ideas. With another theoretical definition of technology we would have interpreted new technology as something just invented and thus have chosen another idea than BITS.

The concept of network around a technology was a guide through the whole study. This way of thinking was very beneficial for the result of the study. During the process we had to reflect on who the actors in the network were and how we could understand their interaction with each other. Here the constructivistic approach was not enough. We had to draw upon the new institutional approach to elaborate

our understanding of the structures that guide the actors' actions. This gave rise to the discussion about the relationship between actor and structure.

The empirical part of our study gave rise to reflections about some concrete mechanisms in the process of building a network. These reflections resulted in our conceptualization of trust among the actors, timing, readiness and social learning. In the discussion about these concepts we realized that we were not the first persons to be aware of these processes. We found support for our reflections in so different theoretical approaches as industrial network theories, theories of regional development and theories of organizational learning.

Today, we do not know what will happen to the network we have tried to establish. Hopefully, the local actors will continue the work and get the network completed and stabilized, but we have no guarantee. The network can just as well turn out to break down. Only the future can give an answer.

By and large we know from the central actors on Bornholm that our study has played an important part in the process of a mutual technological and regional development on the island. If our study, with these theoretical reflections, can play a part in the process of developing the theoretical understanding of technological change we have fulfilled our purpose.

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