

# Boundless Technologies: Mind-setting Value Creations

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## Abstract

Utilization of information and communication technologies is commonly accepted as important to value creation in the knowledge economy. Nevertheless, empirical findings from our business case studies often show that while sophisticated technological tools may be developed, the potentials are not realized. It is evident that technology is subject to adaptive and emergent strategies of use, diverging from the original intention. Within this space of opportunities, we elaborate the importance of constructing strategic concepts as communication tools to support organisational implementation of technologies. We use the concept of organisational implementation as a way of taking the technology into use in order to support changes and value creation in the user organisation.

In this paper we present our findings related to how use and experiences are conditioned by the users' expectations. We have conducted a business case study in order to understand and explore how users employ and use a particular wireless technology infrastructure. On behalf of the infrastructure vendor, we have studied three different organisations that use this technology. The overall research goal of our joint research project was to find out what is good use and for whom.

We find that users struggle to go beyond the expectations they had when they were conceptualising and telling us about their practice. We have good indications that a narrowed consciousness was also conditioning the users' use of the technology.

In this paper we draw the conclusion that technological implementations towards changing work practices and value creation must not be viewed by the company solely as a knowledge acquisition process, but as a process of knowledge creation. Organisational implementation is an ongoing process, a learning process at both the organisational and individual level. Flexible tools and technologies are constituted and shaped in interaction and communication in the workplace. Based on that knowledge, we build up an argument for an organisational implementation framework, including strategic discussions, learning spaces, and concept constructions.

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## 1. Introduction

The investments in information and communication technology (ICT) tools and infrastructures constitute today and for the predictable next few years a large share of Norwegian companies' operating costs (Rømbøll-Management, 2005). However, how and what the technical investments create in terms of organisational changes and value creation is still limited. This may be due to the fact that telling the stories of technologies in use and what effectiveness and efficiency they bring into the workplace is a complex task (Grudin, 1988; Rolfsen, Dahl *et al.*, 2004). Or is the silence a sign of nothingness?

When it comes to introducing new work support tools, it is hard to reach a sufficient level of organisational implementation, an obstacle that is especially prevalent for computer-supported co-operative work tools (Grudin, 1988). This is because adapting such tools into *use* consists of change processes in work practice, from changing work patterns and social power structures to new communication protocols and media (Greenbaum, 1995; Rosenberg, 2001; Bjørkeng and Rolfsen, 2003). It is a dialectical interplay between change of practice and the technology at hand, because both practice and technology limit and make change possible. Nelson and Winter clearly point out that change in practices is hard to implement because routines constituting the practice are evolutionarily developed, and thus, like genes, resistant to abrupt change (Nelson and Winter, 1982). Seen from the technological side, it is argued that in order to support the emergent nature of practice and the use of technologies (Truex, Baskerville *et al.*, 1999), the technology itself needs to be flexible (Jørgensen, Krogstie *et al.*, 2004) and learnable (Bødker and Graves Petersen, 2000). The flexible tools and technologies are in a way continuously constituted, shaped, and learned in interaction and communication in the workplace. But, is flexible technology enough?

In general terms, this paper is a contribution to how to look for the intended value creation of introducing new (flexible) ICT tools into use in an organisation. The phenomenon of the interplay between knowledge and action (Vygotsky, 1978) is studied through the patterns and the dependency between expectation, action, and experience, respectively, as well as the workers' arguments and wishes for the introduced technology, the workers' activities and interactions with it, and the workers' thoughts and reflections on the use of it. We argue that this is an appropriate approach, since knowledge (or at least its representation in concepts and languages) stands in a contradictory position; it opens and closes the space of opportunities for knowledge creation and actions (Winograd and Flores, 1986; Boland and Tenkasi, 1995). Does that mean that in order to act intentionally the mind must be set accordingly?

The topic in our case can be expressed through the question: How can use of wireless ICT make possible value creation for an organisation? In order to handle this broad issue, we have looked for changes in work practice – i.e. innovations in terms of breaking out of routines (Nelson and Winter, 1982) – and we were especially interested in how the users'

expectations of and wishes for the use of the technology conditioned them in breaking out of incorporated work patterns.

We conducted a case study, including three different organisations that use the same wireless technology, in order to understand and explore who they are, what work they are doing, and how the workers employ the technology to support their own work. Since we see a difference among the organisations with regards to types of knowledge work, we will elaborate on this concept and use it in our comparison of the organisations.

The following questions sum up our focus in this paper:

- Does the users' expectations of the introduced wireless technology condition their use of it, and if so, in what ways?
- Can we conclude that users in organisations that have aligned and discussed the use of the technology in the workplace are able to change and improve their performance?
- And finally, what are the lessons learned regarding strategies for implementing flexible technologies?

Before we unfold the stories from the user organisations, the findings, and our interpretations, we present our standings when it comes to the interrelation between knowledge work, technology and value creation.

## 2. Knowledge Work, Technology and Value Creation

Experiments in ICT support for knowledge workers indicates that formal knowledge-management initiatives, in which corporate portals and repositories have proliferated, have not yet produced substantial changes in the way knowledge workers behave. Personal devices such as PDAs are popular, but are not well integrated into the corporate information environment (Davenport, Thomas *et al.*, 2002).

The implementation and use of ICT have not taken hold, in part because they have seldom been accompanied by organisational changes. The most successful companies in matching ICT to their knowledge workers provide extensive training and coaching to help people learn how to select and use technologies that best support a particular job role or task (Davenport, Thomas *et al.*, 2002). One could argue that this is particularly important for knowledge workers in that they are in strong control of their resources, have a high degree of autonomy, and therefore tend to resist technologies that they do not like or understand.

Our line of argument is that the main purpose of ICT should be to serve as tools to the knowledge workers when performing their work, helping them to do it either better and more efficiently or even differently. Our hypothesis is that in order to be successful with

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implementation of ICT – i.e. putting the technology to use – one has to be able to employ the technology in knowledge work activities in the organisations. In our view, value creation in this context is closely tied to how the use of technology makes the organisations able to mobilise and make use of their knowledge resources. So the real challenge is to develop, implement and communicate technological tools and solutions that are actually experienced as helpful to the knowledge workers doing their everyday tasks.

In this paper we make use of the terms “knowledge work” and “knowledge worker”. Several researchers have identified variations in the characteristics of value creation processes in knowledge work/professional service work. These variations are explained due to different characteristics such as the domain choice, the organisation’s resources, and the way the services are delivered (Løwendahl, 2000; Løwendahl, Revang *et al.*, 2001; Carlsen, Klev *et al.*, 2004; Kvålshaugen, Carlsen *et al.*, 2005). There are also many different opinions about how to define knowledge intensive companies; some regard almost all companies which are concerned with sophisticated operations as knowledge intensive (Sveiby and Risling, 1986; Alvesson, 1995), while others define the category more exclusively. According to Kvålshaugen *et al.*, professional service work, thus knowledge work, also occurs in organisations that may be characterised as traditional manufacturing companies (Stabell and Fjellstad, 1998; Kvålshaugen, Carlsen *et al.*, 2005).

Accordingly, we have observed that knowledge work is a heterogeneous set of activities and can be characterised by a number of criteria rather than a certain set of qualities or rules. We do not wish to suggest that there exists one particular way of working which could be labelled as knowledge work. Furthermore, we have experienced that organisations often lack understanding and language to characterise their work, i.e. what activities they want to support, enhance, facilitate, and change or even limit. Our hypothesis is that the use and understanding of different concepts in implementation phases of ICT is crucial due to how it is being adopted, used and finally contributes to the organisation’s value creation. Since new perspectives give new opportunities for knowledge creation and actions (Boland and Tenkasi, 1995), constructing concepts may unlock the practice, by bringing the present out of the box. And, within this dynamic, we may look for two forms of, one leading to new technologies because of new requirements, and another leading to new evolutionary or innovative use of existing technologies.

We do not wish to limit ourselves to any of the existing definitions of knowledge intensive companies. Rather, we introduce a conceptual framework, based on what we have experienced throughout our case studies. We aim to describe the nature of the different user organisations’ work by constructing four different types of knowledge work: *complex problem solving*, *transforming abstractions*, *symbiotic collaboration* and *instant mobilisation*. These knowledge work types are developed on the basis of other research on knowledge intensive organisations, characterising such organisations as consisting of significant incidents of prob-

lem solving and non-standardised production, lack of routine and search for the new, as a combination of cognitive complexity and intensity of attention, creativity on the part of the practitioner and the organisational environment, heavy reliance on individuals and less dependence on capital, and high educational levels and a high degree of professionalization on the part of most workers. Furthermore, traditional concrete (material) assets are not a central factor, but rather the critical elements are in the minds of workers and in networks, customer relationships, and manuals and systems for supplying services. The product is hard to identify as new knowledge and is often being captured in open ended processes (Alvesson, 1995; Håkonsen and Carlsen, 1999; Gjersvik and Blakstad, 2004).

### 3. The Company, Its Technology, and an R&D Partner

NetCom is a large telecom infrastructure supplier. Besides earning money on mobile traffic within their own infrastructure for the consumer market in Norway, they are also offering a customised wireless solution for businesses, called NetCom Wireless Office.

#### 3.1 NetCom Wireless Office

NetCom Wireless Office provides a complete concept for a mobile private branch exchange (PBX). NetCom argue that the Wireless Office enables enterprises to go the whole way and cut the wires completely. As they put it, even the switchboard NetCom Wireless Attendant can be operated anywhere via a portable PC.

NetCom Wireless Office consists of the following modules:

- *Information and network (IN) services*: provides a virtual private network (VPN), hunting group functionality (grouping numbers into a group number; people who call in will get connected to the first free line available in the group), queue, automatic switchboard, immediate call transfer, and absentee marking from mobile or mail system
- *NetCom Wireless Attendant*: provides full switchboard functionality and connected to IN Queue service
- *WEB Administration*: mediation device for online interface to the IN services, database storing of all customer information and WEB application for IN service administration
- *Assisting Intelligent Peripheral*: A set of 20 announcements available for each company.

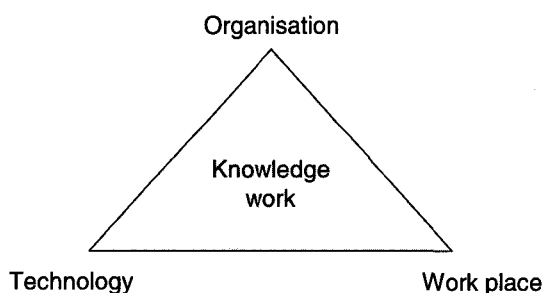
From our point of view, based on experiences with the user cases, the core product and service in NetCom Wireless solution is mobile phone technology and functionalities. We have also focused on the mobile phone as a key deviser, even though NetCom facilitated wireless ICT (computer technology such as VPN) at the time we did our data collection.

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NetCom argues that there are three main reasons why a company should employ their wireless office technology, and they are: *increased availability* (workers can fill in for each other in groups, provide flexible switchboard solutions, transfer calls via their mobiles), *increased efficiency* (liberates calls to the switchboard, workers can choose where they wish to be available, calls come to the correct recipient) and *cost savings* (only one subscription per employee, no transfer of the landline internal phone, no costs involved in upgrading and moving, internal calls included in the monthly price).

### 3.2 The Knowledge Workplace

The Knowledge Workplace is a research project on new office solutions, technological solutions and new ways of working in knowledge intensive organisations. The Knowledge Workplace project consists of several projects in which organisations or networks develop, build, and use new workplaces, technological solutions and offices. The research focuses on knowledge based, knowledge intensive, and knowledge producing organisations and networks (Gjersvik and Blakstad, 2004).



**Figure 1.** The Knowledge Workplace

The main goal in the research project is to explore the relationships between:

- organising, organisation development, and new ways of working
- information and communication technologies
- architecture, new office solutions, and physical infrastructure
- knowledge work

With regard to the figure presented above we focus on the interrelationship between technology (wireless ICT) and organisation (implementation strategies). We discuss how this dimension (technology – organisation) relates to the knowledge work that is performed in each of the user cases (companies) in our research. In order to get an overall impression of their knowledge work and how they use the wireless communication technologies to support it, we needed also to get an overview of where they are working, i.e. their work places.

### **3.3 Our Methodological Approach**

We wish to categorise our methodological approach in this project into two main traditions, namely action research and grounded theory. Throughout the research project we have worked with both the supplier of the wireless office technology and the user organisations.

In the process of doing research together with the technology provider we have chosen an action research approach. The action tradition emphasises the co-generative learning processes (Elden and Levin, 1991; Carlsen, Klev *et al.*, 2004) between researchers and the organisation in the combined production of new knowledge and practical changes. A common feature of action research practices and methods is that they aim to bring members of different communities together to take responsibility for planning their future (Karlsen and Hoholm, 2004). We have employed action research not as one unified method, but rather as a way of designing learning arenas where both involved actors from the technology supplier and user organisations have participated and contributed to dialogues in order to create knowledge as a basis for action and change.

Similar to reflective practice (Schön, 1983); action research enhances reflection on the immediate problem situation. Such reflection combines theory, experience, social dialogue and construction of meaning. This has mainly been our approach to building theory within a framework of grounded theory. Grounded theory is a research method that seeks to develop theory that is grounded in data systematically gathered and analysed. Throughout the research project we have developed theoretical accounts of the general features of a topic, while simultaneously grounding the accounts in data. We seek to manage a continuous interplay between data collection and analysis. In this paper we use grounded theory as a framework in order to develop context-based, process-oriented descriptions and explanations of our research topics (Orlikowski, 1993).

## **4. Three Companies, a Technology, and Findings**

In this section we present our case studies through three constructed stories. The stories reflect our understanding of the users' expectations, use, and experience of the NetCom Wireless Office.

### **4.1 Method: Selection, Data Collection and Presentation**

The case study was carried out in the fall of 2004. We have created a semi-structured interview guide, including: i) their historical background and current position in the company, ii) describing NetCom Wireless Office in their own words, iii) the arguments for NetCom Wireless Office, iv) what work they are doing, how and where, v) how NetCom Wireless

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Office supports them in their daily work, vi) what were the main introduction activities, and vii) what are their wishes for a future technology.

We conducted 23 interviews. The interviewees represent both management (5) and workers (17). Three of the managers (one in each company) were NetCom's contact persons and members of NetCom's reference group. We analysed the answers and grouped them together. Based on that analysis, we created a rich media, containing headings, pictures, facts, theories and questions. We use this rich media as a reflective and communicative tool, and as a boundary object (Star and Griesemer, 1989), in our current phase of action research (more on this subject in Section 5.5 on page 14).

The three organisations are given the anonymous titles of the Global Consultants, the Service Company, and the Virtual Company.

## 4.2 The Global Consultants

"The mobile phone is the most personal thing you own, starting from when you are eight until you die."

In the cafeteria on lunch break last week, I talked to the middle leader who was the initiator behind our company's choice of changing from the old fixed phone system to NetCom Wireless Office. In some ways he mentioned the arguments for choosing the new solution, and what strikes me was that he says that he wanted the company to be innovative and trendy. I didn't ask what he meant by that, but I have an idea that it has to do with recruiting new employees and changing the company's identity. The only argument we employees heard was that NetCom Wireless would save money and that it would make us more available. Indeed we are available for our customers, and that is important, almost as important as to be there for our colleagues. I understand the emphasis on the economic argument. The corporate management, who are also the owners of the company, are often more focused on costs than on investments.

Regarding our change into becoming more available, I believe we still have, as an organisation, a way to go, especially regarding our "phone culture." We still have a lot to learn. For instance, not everyone turns off the phone when they are in (face-to-face) meetings with others, and something has to be done about our expectations of others' availability. Take this story as an example: One fellow called my colleague the other day. My colleague said he was busy for the next several hours. The fellow, who was a business associate said: "Don't worry! It's not important; I'll call you in the evening." You ask me how I handle my availability. For sure, if that fellow had called me up during dinner at home, I would not have taken the phone. Yes, I'm screening who is calling. In my job as a business advisor, I have important customers and not so big customers. But, as I told you, if a colleague is calling I answer, even during dinner with my wife. A good example was last week when

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a colleague called me from a bar in Malaysia. I didn't know where he was when he called me up. But that is a good example of how we are there for each other. He had a customer sitting in Norway on the line, who needed some advice that my colleague didn't have access to from where he was. After a short briefing and a click on the phone in Malaysia, I was consulting with the customers. I found the information needed through my laptop and, after a few minutes, case closed.

Yes, it is quite often that we are abroad. We are a global company with more than 100,000 employees (900 in Norway). Our core business is advising our customers in revision, strategy and economy, and legal issues. And, for some of us this corporate advising leads to a nomadic work life, half at the office and half at the customers' locations. NetCom Wireless Office supports this nicely. No, we are not always working alone; mostly we are working on projects involving our members and the customers. It's quite an intense collaborative work we are doing. And through the years I have developed a large contact base. But now, I'm sorry, I have to go to a new meeting...a project meeting.

### **4.3 The Service Company**

Why did we choose NetCom Wireless Office? Take a look at us, and you will probably not think of us as trendy or a leading user of technology. But we also have needs, and of course we are always considering alternative cost reductions. Two years ago the head office moved into a new building, and in that change we were considering our needs for technical infrastructure, both phone and data. We chose NetCom Wireless Office as our platform because of its favourable cost savings and because it would make all of us more available to our customers.

We are the largest customer organisation in Scandinavia within our segment with almost half a million members, and we have been growing ever since the beginning of the last century. Today we have about 360 employees, with 130 stationed at the head office in Oslo. The others are spread out throughout local centres all over Norway, 83 in number.

Who we are should also be seen from the viewpoint of the way we are. We exist because of our members. We offer our members individualised legal aid and advice, on-location training and testing, and different products and services accommodating our members as an interest group. For the members, we are more or less a way-of-life companion.

You ask me how we use NetCom Wireless Office. It is a mobile phone, isn't it? Yes, of course it is an important working tool. Our main objective is to serve our members, and much of our interaction with them occurs through phone conversations. We are mostly organised through services, so we have adapted several call groups (hunting groups). Take the legal department, for instance. We offer 24 hour legal service for our members. Outside of daily business hours, we are virtually connected to the company's alarm centre, meaning that

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one of our lawyers is always on call. In the daytime the call groups work nicely. There are always two lawyers of 6 who are logged in to the group, and they handle and coordinate the call rush both by observing a web interface that shows a real-time queue of waiting calls, and by giving each other physical signs (all the lawyers can see each other through walls of glass).

At our locations out in the districts, we also use the ability to personalise the relationship between our testers and the members. After a test, the member gives a receipt with the phone number to the tester who has done the test. It is more likely that the members need to get in touch with him than with somebody else in our organisation.

Overall I think we are quite satisfied with NetCom Wireless Office. We don't use its full potentials, that's for sure, but I think we are heading in the right direction. The management has done a strategic choice when it comes to who are allowed (sponsored) to use the office phone for private purposes outside working hours. Regarding our availability, I will argue that it is not necessarily a good service to route incoming calls to my personal voice mail; for me it causes stress when I see that I have ten or more messages waiting, and the customer (our member) who called me can in most cases be served by someone else who was available at the time she called. I'm not sure pre-defined hunting groups are the solution in all cases; I have more than one role, and would not like to continuously handle in and out logging of several groups. When it comes to our "phone culture," don't let me get started -! In some way it seems as if the phone call, irrespective of who it is, has the highest priority. I think that the majority respects the concept of no phone calls during (formal) meetings, but beyond that, either when we are eating in the cafeteria or meet for a professional chat in the corridor, the incoming calls interrupt and often terminate the face-to-face activities.

#### **4.4 The Virtual Company**

We are a small (10 employees) Norwegian consultancy company, delivering consulting and technical services (ERP systems) to mainly large industrial companies. We have also developed our own provisioning solution in close cooperation with leading Norwegian telecom operators. Our strategy is to be a highly expert consultancy company within the chosen fields (ERP and telecom).

We were founded in 1998 and have a highly qualified staff whose expertise ranges over supply chain and automation of business processes, in addition to IT, logistics, production and finance. Our company may be characterised as a knowledge intensive company, due to our large number of highly qualified employees, most of them with academic qualifications. Furthermore, much of our work can be characterised as complex problem solving involving ICT development – designing system specifications. We are also working in teams that de-

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mands high intensity of coordination and interaction. However, not all our work is typical knowledge work. Many of our production processes are clearly defined, with specific customer demands, and can be characterised as replicable and routinised work. Much of the time we are also performing individual work.

We have used NetCom Wireless Office solution since we were established, and were one of the earliest users of this technology in Norway. In addition, our company does not own any offices, except from the basement of the manager's house, and we operate mainly outside at our customers' offices. For us it was very natural to employ the wireless office technology because of the mobility and flexibility this technology offered us. Furthermore it was very appropriate for us since we needed a wireless switchboard. Maybe the most important argument for us to choose and implement wireless office technology was the cost saving potential for us. We think that has a lot to do with the size of our company as well as our structure and services.

One the main purposes of using the wireless office technology was to be able to reach the other employees as well as other people in other companies by just dialling one number. "It is not the company I want to speak to, it is the person."

So availability is a key issue in this company, with regard to being able to contact and make use of other people's competencies.

Furthermore, one main challenge for us is to function as a collective, given that we are localised and work in different parts of the country, along with not having any of our own offices available. Our manager invests a lot of time communicating with us, both virtually and face to face. For instance, all the employees in our company meet once a month at a restaurant downtown (in Oslo), which gives us the possibility to share knowledge and in that way strengthen our collective. The wireless office technology surely contributes to building our organisation, but it is not enough.

Finally there are a lot of functionalities in the technology that we do not use. We mainly use the mobile phone function, i.e. calling one another, which is regarded as the core component of use. One may expect that this company, which defines itself as "the virtual company," should use more of the functionality. One of the possible reasons why we do not could be that we hardly discuss the meaning of being more available, flexible and boundless. We are to a very small extent asking ourselves how the use of technology can support, improve, or even change our knowledge work. Furthermore, what is the true nature of our work, aside from the fact that much of our work is presumably, to a large extent, based on knowledge?

#### **4.5 Comparisons: Who they are, What they do and What Changes are Observed**

While collecting our data we were engaged in an ongoing process of understanding and

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describing our findings, alternating between developing theoretical concepts and interpreting data, making use of grounded theory principles (Orlikowski, 1993). We try to explain what the organisations actually do, in terms of what kind of knowledge work they perform. Our conclusions, assumptions and indications are, however, drawn from an individual to a collective level. In our empirical analysis we have developed a framework consisting of different types of knowledge work. As we have argued, we lean on other research and frameworks in our conceptualisation (Alvesson, 1995; Stabell and Fjellstad, 1998; Håkonsen and Carlsen, 1999; Gjersvik and Blakstad, 2004; Kvålshaugen, Carlsen et al., 2005). We would like to emphasise that our framework is based on and relates to the user cases described in this paper.

Our main focus of analysis was to investigate how the use of wireless office technology contributed or helped the workers in their ever day tasks. We have created some superior types of knowledge work in order to create a language to describe the characteristics of this work. Our purpose was also to make it possible to compare the different user organisations with regard to the content of their work and see how their use of wireless solutions may be influenced by differentiations in knowledge work types.

#### 4.5.1 Types of Knowledge Work

We have developed four major types of knowledge work, which may contribute, in future research, to build a typology of knowledge work.

The knowledge work type *complex problem solving* can be exemplified by such activities as advising the customer or developing ICT systems when the problem is not well defined, or with regard to conflict negotiation situations where the outcome of the situation is very hard to predict and when each of the incidents is unique and unknown.

The knowledge work type *transform abstractions* refers to such activities as writing articles, or working within a symbolic framework such as law, programming languages, or strategy structures. By the term “abstraction” we mean symbols, models, texts, pictures, and designs, etc., which all are abstractions or representations of reality. The activity of transforming refers to the work of changing, developing or even manipulating the abstractions.

The knowledge work type *symbiotic collaboration* relates to activities such as co-generated technology design where the supplier and the user collaboratively create the solutions, teamwork where the knowledge workers are dependent on each other in order to get the work done and the quality of product or service is impossible without joint cooperation. The main point with this knowledge work type is that the work always has to be dependent on two or more workers in order to obtain the result, as opposed to individual work or group work where the group members work autonomously.

The knowledge work type *instant mobilisation* involves functions such as 24-hour service, service alarm centres, or consultancy services with big clients.<sup>1)</sup> This type involves work that could be characterised as being able to provide the customer, the patient, the guest or the

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member with service within a short time, whenever the service or the product are asked for or required.

In the table below we have given each of the companies three values – low, medium, and high – with regard to how distinct they are in each of the knowledge work types. The values represent the average conducted from our data and document studies. We have also given short examples of activities for each of the companies and each of the knowledge work types. They are abstracted from the case studies in the paper.

**Table 1.** Knowledge work they are doing

Company	Complex problem solving	Transform abstractions	Symbiotic collaboration	Instant mobilisation
Virtual Company	<b>Medium:</b> <ul style="list-style-type: none"> <li>• Some ICT development</li> <li>• Mostly ICT customisation, integration and deployment</li> </ul>	<b>High:</b> <ul style="list-style-type: none"> <li>• Mostly: Designing system specifications</li> <li>• Some: Programming new customised software</li> </ul>	<b>Medium:</b> <ul style="list-style-type: none"> <li>• Some: internal teamwork</li> <li>• Mostly: individual work</li> </ul>	<b>Medium:</b> <ul style="list-style-type: none"> <li>• Some: customer support</li> <li>• Some: mobilising internal resources</li> </ul>
Service Company	<b>Medium:</b> <ul style="list-style-type: none"> <li>• Some advising</li> <li>• Some product and service development</li> <li>• Mostly performing standard services</li> </ul>	<b>Low:</b> <ul style="list-style-type: none"> <li>• Mostly processing document flow</li> <li>• Mostly performing routinised services.</li> <li>• Some high abstraction work (legal department solving legal issues)</li> </ul>	<b>Low:</b> <ul style="list-style-type: none"> <li>• Mostly: one to one services</li> <li>• Low: internal teamwork</li> </ul>	<b>Medium:</b> <ul style="list-style-type: none"> <li>• Some: operating the alarm central</li> <li>• Mostly (presumably): serving members when required</li> </ul>
Global Consultants	<b>High:</b> <ul style="list-style-type: none"> <li>• Mostly advising customers</li> <li>• Some use of standardised methods</li> </ul>	<b>High:</b> <ul style="list-style-type: none"> <li>• Mostly working with abstractions like laws, organisational structures and strategies, and economical analyses</li> </ul>	<b>High:</b> <ul style="list-style-type: none"> <li>• Mostly: based on project work</li> <li>• Mostly: working collaboratively with the customers</li> </ul>	<b>High:</b> <ul style="list-style-type: none"> <li>• Mostly: mobilising internal resources continuously to provide any given project with the customers</li> <li>• Mostly: retaining personal relations to their customers</li> </ul>

From the table above we see that all three companies in our case studies, in our terminology, represent a high degree of knowledge work. However, the Service Company differentiates in, to a larger degree, also representing more traditional manufacturing work. Their working procedures are to a greater extent standardised and the work more routinised. The

1) Referring to the case study of the large multinational company.

Global Consultants distinguish themselves by mostly performing knowledge work. Their work processes could better be described as open-ended value workshops than as more linear value chains (Stabell and Fjellstad, 1998). They also report that knowledge is both its primary input and output. The Virtual Company does also to a large degree perform knowledge work, but not to the same extent as the global consultants. Much of the virtual company's work consists of ICT customisation, integration and deployment, and they are doing much individual work. So, ranging the three companies on a continuum from less to much knowledge work, the Service Company has the least, the Virtual Company is in between, and the Global Consultants have the most typical knowledge work activities.

#### 4.5.2 Where they are Working

The companies differ in size and lines of business, and they are working in different places. In this section we compare the organisations' work places in order to get a richer impression of the contexts of their knowledge work and to be able to consider the necessity of the wireless communication technology in their daily work. We have adapted the concept of the telework office (Vos, van Meel *et al.*, 1997) in order to categorise the different work places. This framework is suitable for our purpose, because NetCom Wireless Office is making possible that work can be done wherever the users have access to a wireless technology infrastructure. The types of teleworks are:

- Club (main) office: an office which is used in addition to telework offices
- Satellite office: a telework office facilitated by the employer
- Business office: a telework office facilitated by a commercial provider
- Guest office: an office in the building of a principal or a client organization
- Home office: a workplace located in the residence of an employee
- Instant office: a workplace instantly created by the user in a place which is not primarily designed for office work

**Table 2.** Places they are working

Company	Main office	Satellite office	Business office	Guest office	Home office	Instance office
Virtual Company	None	<u>Some</u> ( <i>managing director</i> )	None	<b>Mostly</b>	<b>Mostly</b>	Little ( <i>car</i> )
Service Company	<b>Mostly</b>	Little ( <i>visiting locations</i> )	Little ( <i>hotel</i> )	None	Little ( <i>managers</i> )	Little ( <i>car</i> )
Global Consultants	<b>Mostly</b>	None	<u>Some</u> ( <i>conferences etc.</i> )	<b>Mostly</b>	<u>Some</u> ( <i>available for customers</i> )	Little ( <i>car, airport etc.</i> )

Table 2 indicates two similarities: both the Service Company and the Global Consultants are doing much of their work at their main offices, while both the Virtual Company and the consultants are working frequently at their customers' offices (*guest offices*). But the characteristic features, at an organisational level, are that they are different when it comes to work places. The Virtual Company is characterised by their virtual presence for each other. The consultants stand in the dualism of in-house (*main offices*) and out-of-house (*guest offices*), while the Service Company is mainly stationary at their home base (*main offices*).

From this comparison we may conclude that the knowledge workers at the Virtual Company and the Global Consultants are more mobile and nomadic than the Service Company, as regards to work at and move between different places. The framework offers no concepts to describe the degree of frequent place shifts or planned place shifts. This is probably what distinguishes them most, since the consultants are frequently shifting places, and the movements can often be characterised as interruptive and unplanned.

Regarding where the knowledge workers are working, the necessity of NetCom Wireless Office as an ICT infrastructure is high for each organisation. But because of its frequented and interrupted movement, the knowledge work at the Global Consultants relies more on the availability and mobility features of the technology than the other two.

#### **4.5.3 Company Identity and Technical Skills**

The Virtual Company has generally high technical skills, while the consultants have high technical skills when it comes to use of new technical work support devices such as mobile phones and laptops. The Service Company is more internally divergent. It has groups of employees (also older ones) who were not used to using mobile phones and laptops in their daily work.

Company identity is an even more blurred and vague concept to define than technical skills. In our study we were not looking for this organisational (cultural) feature, but as we went along, we heard that the knowledge workers argued their use and expectations in terms of who they are. The Service Company sees themselves as traditional, national culture bearers, and service oriented, but also as someone trying to follow the trends in the information age regarding services and communication with their customers. The consultants are also standing somewhere in the tension between the traditional and the modern. While the workers at the Virtual Company see themselves as flexible workers with the freedom to control their own work regarding time and place.

#### **4.5.4 Changes and value creation**

Although the companies are different when it comes to knowledge work, work places, company identity, and technical skills (in addition to, for example, size and line of business), we find no significant difference in their use and experiences of the technology. They

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seem to struggle with the same difficulties in showing how the implementation and use of wireless technology have contributed to value creation. The reason why they have failed to bring out the full potential of investing in modern ICT could be that they have not taken into consideration what kind of (knowledge) work they want to improve or change with the technology.

Furthermore, in our case study, the users say that the organisational arguments for introducing new wireless ICT are that the enterprise reduces costs and that the knowledge workers become more available. We find that these two arguments are like coloured glasses they see their experiences through. The users within the same organisation can communicate with each other with no extra costs. This, combined with the users' technical availability through personal cellular phones that they are wearing, has led to more frequent phone calls among the workers. But they cannot tell us whether they talk more to each other, or whether the infrastructure has strengthened the community of practice in one way or another. The users feel that they are more available both for colleagues and for customers, and most of them think that this is a good thing. They say that they become more efficient, but they struggle to explain how. They often explain their increased efficiency in terms of their increased availability. Apparently users struggle to unlock and go beyond their expectations. The users' stories of their practices give clear indications that narrowed expectation restricts (conditions) their actions and use of the technology.

Alternatively, can we conclude that the technology has reached its potential?

## **5. Discussion Around Strategies and Minds**

In this discussion we argue that it is important to examine and make space for (critical) reflection about what kind of knowledge work one wishes to improve in order to be able to move with flexible and convenient technologies towards change and value creation. For instance, when it comes to employment of wireless ICT, it would possibly be crucial to ask the question, why do we want to increase our availability and what impact does that have on our knowledge work?

To sum up the story of the following discussion, we start with an elaboration of the fact that in the process of acquiring new technologies, the motivation for change is usually present. We address and discuss the motivation and outcomes of employing the technology, by exploring the diversity of strategies for implementing new technology in the work place. We follow up with a discourse on languages, understandings, and reflections in change processes.

### **5.1 Changes are Welcome, but it is Hard to Predict and See them All**

An organisational implementation of ICT work support tools, that is, to take new tools into use, consists of change processes in a company, from changing work patterns to changing

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social power structure (Winograd and Flores, 1986; Bansler, 1989; Greenbaum and Kyng, 1991; Grudin, 1994; Engeström, 1999). A change is indeed the intention; otherwise the intervention is meaningless. But unfortunately a major challenge for the organisational implementation process is that not all changes are known in advance; either they are not predictable and found because of our lack of understanding concerning complex systems (Grudin, 1994), or they are intentionally hidden and unspoken for those whom the changes concerns.

Finding all possible changes in the pre-implementation phase is an unattainable task, but to allow multiple voices and perspectives to appear and grow in the process is argued as an appropriate solution in the right direction (Winograd and Flores, 1986; Ehn, 1992; Muller, Haslwanter *et al.*, 1997). A central premise within this challenge is related to different stakeholders with respect to the system, such as technology vendors and users (managers and employees). In the cases we examine in this paper the implementation processes are mostly ICT or HR management driven. The management holds the motivation and the drive for the organisational implementation and the change of practice. But what kind of changes are they heading for?

## 5.2 Implementation Strategies: from Replacement to Transformation

New technology can be used to replace existing technologies or processes in an organisation, but, additionally, it can also be used to change work practice and therefore lead to (innovative) value creation. We can then talk about two distinct forms of implementation and adoption strategies: replacement and transformation. Table 3 outlines the two strategies.

**Table 3.** Replacement and transformation strategies of implementing new technology

Implementation strategies	Focus and orientation	Level of disturbance	Organisational features	Technological features	Motivation and outcome
Replacement	Technical solution	Silent	Facilitating spaces for (individual) learning of technical functions	Transparent replaceable technologies	Cost reduction and effectiveness
Transformation	Change processes	Noisy	Facilitating spaces for social reflection, dialogue and learning the use of the technology in change practice	Flexible technologies (Jørgensen, Krogstie <i>et al.</i> 2004)	Innovation, value creation, and efficiency

In our case, both strategies were present in all three organisations. All of them were clear and concrete when it comes to the objective of cost reduction, which is no wonder due to the importance of economy in business. But the concreteness should also be explained by the high tangible quality of the artefact (cost). Another important aspect is that the function-

ality of an old system had to be replaced. The organisations will not survive without their internal and external ICT infrastructures. When it comes to value creation, the explanation of the expected change was more abstract and, therefore, in a sense, incomplete and “intangible” to use as a motivation; the users were lacking concepts for why and how availability is important for the value creation of their company.

### 5.3 Organisational Changes: Breakdowns or other Spaces for Reflections

Either an organisational change is revolutionary or evolutionary; the organisation goes through a learning process, in the sense of adapting new ways of organising and working. The reflection and evolution parts of the whole may vary due to the variation of changes.

When it comes to introducing new technology into the workplace, we may talk about disturbing (noisy) and non-disturbing (silent) technology. In our case the NetCom Wireless Office may be seen as a silent technology. From one point of view (the cost reduction standing) the organisations in our case study see the acquisition of NetCom Wireless Office, a mobile phone system, as a replacement for the old fixed phone system. But are the two systems transparently replaceable?

If you place the mobile phone into a station at your desk, you have made a transparent replacement of your fixed phone as a communication and availability technology. But that is not the affordance (Norman, 1990) or the intention of the product. It is designed and meant to be worn in some way or another. And, when bringing your mobile phone and conversations with you wherever you go, you have transformed your availability and the way you interact and collaborate with others.

Users talk about their increased availability and that they are able to move around and work in other places than at the office. But the majority do not consider this as a (radical) change of practice. Is this because they are familiar with the use of wireless ICT infrastructures and devices such as mobile phones from their private and earlier business lives? Or is it because the flexible features of NetCom Wireless Office have led to a silent (non-reflective) evolutionary use?

Flexible technology is important technical feature for transformational (and emergent) change (Jørgensen, Krogstie *et al.*, 2004). Since the technology at hand always conditions the present activity, the technology restricting (framing) the opportunity of activity changes. Flexibility is needed, but the feature itself is also an inhibitor for change. Flexible technology itself does not imply learning and change, which can be explained from two angles.

Firstly, the preconditions for reflection as the core learning process are experienced breakdowns and spaces for discourses and discussions (Høystrup, 2004). This means that NetCom Wireless Office as a flexible technology lacks friction, which certainly applies when there are no clear transformation objectives (availability as an empty concept). During the inter-

views, all of the interviewees were reflecting on the concept of availability. Who or what is to be available, person, organisation or function? After a while it became clear that none of the three organisations had discussed what it means to be available and why. Each organisation has availability as a strategic goal. They say “we introduced NetCom Wireless Technology because it will make us more available.” Because of the lack of concreteness and organisational discourse on the matter, we heard them talk about their *individual* strategies for handling their own and consequently their company’s availability. NetCom Wireless Office as an availability technology was becoming a boundless technology in both senses, a technical solution that breaks the place dimension of communication and a solution that blurs the borders of social worlds between private life and business life, between physical (face-to-face) presence and everyone else, and between concentration and interruptions. The latter was discussed by two of the users. They talked about good phone culture (a term coined by the users themselves) and that it more or less has been a norm (rule) that you make yourself unavailable for phone calls when you are in (formal) meetings, but it is not accepted to turn off your phone when you are occupied with individual work. The individual strategies for controlling one’s own availability are also an indication that the implementation strategies led to a silent distribution of responsibility, which caused increased frustration. Since this was not raised for discussion, these individual (and perhaps a bit silent) breakdowns were not controlled towards a joint organisational change of handling the companies’ availability for who and what.

Secondly, routine is hard to break (Nelson and Winter, 1982). The majority of the users did not use the functionalities of NetCom Wireless Office besides the ordinary voice mail and mobile conversation. Most of them had tried these features out during a short training period associated with the introduction of the technology, but as one user put it: “the put-someone-through function is nice, but unfortunately I have forgotten how to do it...and regarding setting up a conference call, I have forgotten that that was possible.” When it comes to the other functionalities, they were for the most part not even mentioned when the users talk about their use and experiences. The functionality and features of NetCom Wireless Office can be divided into convenience and necessity (Basalla, 1988). The users find the extended functionalities of NetCom Wireless Office compared to earlier technologies more as nice-to-have rather than need-to-have functionalities. It is harder to implement convenience technology, since either it is not seen as important for doing the job or it is competing with other means of achieving the same support, technically and/or socially (Rolfen, Jørgensen *et al.*, 2004). We take the path of least resistance; I do not need to “put someone through”, “make a rapid conference call,” or “sending out group sms.” When it comes to convenience technology, it is not enough to say that it is a useful technology; you must also say that it is an important technology. It is important in order to achieve (concrete) business goals.

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As we have mentioned, the implementation strategies were a mix of both replacement and transformational, although with an emphasis on the first one. And all three organisations manage to quickly reach the first implementation level – replacing old systems with NetCom Wireless Office. The extended use of the technology to support new ways of working was individual driven and, for the most part, not shared.

#### 5.4 Minds: transactional versus transformational

Although we did not see any significant difference between the three companies, when it comes to objectives and use of the technology, we can divide the users into two groups: those who look at the new technology as a replacement for an old one, and those who regard it as a tool for new, innovative ways of working – respectively the group of *transactional minds* and the group of *transformational minds*. The concepts of “transactional” and “transformational” are applied when discussing transactional and transformational leaderships (Northouse, 2004; Rosemary, 2004), and we are using them to describe two mind-sets;

“A transactional leader is defined as one who operates within the existing system, prefers risk avoidance, focuses on efficiency and utilizes process over substance to maintain control. Conversely, transformational leaders explore new ways of working, seek opportunities in the face of risk and are less likely to support the status quo” (Rosemary, 2004).

The groups are company independent. A clear distinction is that the transformational minds focus more on what the technology can do for them than on what it is.

**Table 4.** The person who meets the technology

Minds	View of technology	Adoption strategies	Learning goal	Learning space	Self awareness (identity)
Transactional	Technical	Replacement	Mastering the technology in order to employ it into existing work practice	Within the frame of existing conditions and practices	Linear and traditional
Transformational	Conceptual (Practical)	Critical reflection	Mastering the technology in relation to work change. Seeking new opportunities	Questioning conditions, attaching assumptions and crossing borders	Interactive and opportunistic

The distinction between the transactional and transformational learning spaces is similar to what Argyris and Schön call single-loop learning and double-loop learning (Argyris and Schön, 1978).

We argue that in order to discuss how the technology could support the knowledge work and thus contribute to value creation; one should apply transformational information and motivate the knowledge workers towards a transformational mind-setting.

### 5.5 Boundary objects and other places: seize the change to value creation

In the last decades, systems development communities, and especially those within the field of participatory design, have been emphasising the importance of language and boundary objects (Star and Griesemer, 1989) in the communication between communities (Muller, *et al.*, 1997; Winograd and Flores, 1986).

“[Boundary] objects do not convey unambiguous meaning, but have instead a kind of symbolic adequacy that enables conversation without enforcing commonly shared meaning” (Boland and Tenkasi, 1995).

Boland and Tenkasi emphasise the role of boundary objects in the matter of visible representation of individual knowledge, as a means of perspective taking by humans in and between communities. As a boundary object, a narrative has the ability to bridge communities in the matter of inter-subjectivity. To communicate and organise a room for reflection between NetCom Wireless Office and its users, such a boundary object was created, i.e. a book with a mixture of observations, citations, research questions and astonishments, based on the interviews (Figure 2).

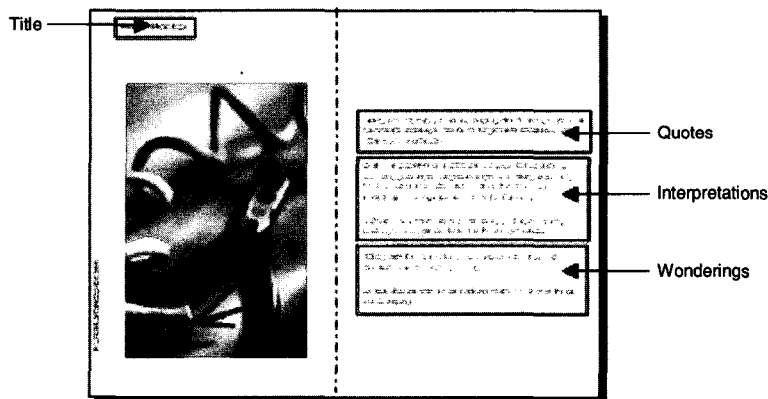


Figure 2. Illustration of the page structure in our book

We created a book with narratives, rich illustrations and contexts, as a tool to help NetCom Wireless Office formulate a strategy for a better implementation, and provide possibilities to create other expectations. Accordingly, the book consists of substantially co-created concepts with regard to an understanding of the technology – what it can do for the com-

pany – different meanings and implications of being more available, different views on value creation, etc., to mention a few. Our purpose was to contribute to learning in use as ways of setting the mind for value creation. We have experienced that the workers in NetCom have found the book very interesting and have chosen to employ the concepts in their communication strategy. The challenge for further improvement is to enable reflection rooms between NetCom and its users, both in implement phases and in use, thus enhancing mind-setting value creation. A Deweryan construction-view treats “design as inquiry, inquiry as dialogue and dialogue as the source of all tools, including mental constructs” (Erskine, Carter-Tod *et al.*, 1997).

## 6. Conclusion and Further Work

Although the companies are different, we find no significant difference in their use and experiences of the technology. They are struggling with the same difficulties in describing how the implementation and use of wireless technology have contributed to value creation. We find that this is because the concept of availability (one of the employment objectives), lack concretisations regarding what kind of knowledge work they want to improve or change with the use of the technology. The objective was “intangible” and therefore hard to use as a motivation for change.

Based on our understanding of the three companies’ use of NetCom Wireless Office, we conclude that we see a dependency between the arguments and wishes for the technology and the users’ experiences of their use of it. Changes according to availability have occurred, but the lack of discourse and discussions has led to individual adoptions, and we have good indications that it sources the growing frustrations among the knowledge workers.

None of the organisations have employed a practice-oriented (transformational) implementation strategy. In the introduction phase, all the workers were trained to operate the technology. But this pre-employment knowledge acquisition does not take into account the dialectical nature in and between knowledge and action and between the nature of knowledge work and the use of technology.

A lesson learned is that an implementation strategy towards changing work practice and value creation must not be viewed solely as a knowledge acquisition process by the company, but as a process of knowledge creation. A linear approach to transformation, i.e. learning the technology and then using it, fails, since it suppose that all users are readily capable of understanding the potential of new technologies and acting accordantly. In order to discuss how the technology can support knowledge work, it is important to reflect and learn the nature of that knowledge work, and inherently where the work is performed; what are the work places.

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Boundless technologies, as NetCom Wireless Office, need social bounds and borders in order to support desirable evolutions and changes. The borders of social worlds like those between private life and business life, between physical (face-to-face) presence and everyone else, and between concentration and interruptions, must be discussed in the organisation in order to achieve common use strategies and prevent distributed responsibilities and frustrations regarding individual boundary settings.

When it comes to employing flexible technology it is important to consider its degree of friction compared to incorporated practice. A flexible technology has the ability to be adapted into the existing use patterns of an old technology, and therefore, in that sense of being frictionless, it becomes an inhibitor for change. It is important to set the scene (the minds) with clear and concrete objectives for the use of the technology, discussing why the organisation wants to employ it. This is particularly important for knowledge workers in that they are in strong control of their resources, have a high degree of autonomy, and therefore tend to resist technologies that they do not like or understand. In our view, they should discuss value creation that is closely tied to how the use of technology makes the organisations able to mobilise and make use of their knowledge resources. So the real challenge is to develop, implement and communicate technological tools and solutions that are actually experienced as helpful to the knowledge workers doing their everyday tasks.

Currently we are following up our research activities with NetCom. Together we are developing an organisational implementation framework that includes interrelated actions such as:

- Strategic discussion: The decision of introducing technical infrastructures must be discussed at the strategic level of an enterprise and be linked to value creation in general
- Facilitated learning: When introducing flexible technology, the organisation must arrange and make space for discussion and learning at the organisational, group, and individual level
- Constructed concepts: Constructing and re-constructing concepts for use will bring the technology and the use of it further. This should be ongoing activity in order to ensure that flexible technology is likely to be aligned to the overall business dynamics.

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