The thesis discusses lessons learned and issues raised when exploring how self-produced rich media can facilitate sharing of meaning between healthcare professionals at an intensive care unit and between healthcare professionals and patients within a hand surgery clinic.

Design experiments conducted at the intensive care unit focused on how healthcare professionals could collaboratively produce ‘best practice’ videos displayed on handheld devices and accessed through barcodes placed out in the unit. The making of the videos it is argued can be seen as a temporary convergence of different views when reifying ‘best practice.’

Design experiments conducted at the hand surgery clinic focused on how healthcare professionals and patients collaboratively could produce, during consultations, rich media documents that are tailored to the patients’ specific needs. The rich media documents made can be seen as a temporary convergence of two distinct practices; namely that of hand surgery treatment and the practice of everyday life.

Making of rich media documents in both projects resulted in developing relational spaces of informal learning, which engendered the making of rich reifications that function well in close relation to participation. To engender the making of the rich media documents demanded the establishment and hardening of a socio-technical infrastructure which can be seen as a temporary convergence between tools and practices where both the tools and practices are changed.

In both cases using these videos in turn demanded that the videos, a form of local collaborative hardenings, needed to be translated anew and so to speak “defrosted.” The design consequences are that designers need to acknowledge materiality as an ongoing process which is given meaning through participation over time within and across communities of practice. Materiality and human agency in this instance are not seen as discrete elements, but rather highly intertwined. The second design consequence is that we need to acknowledge the complexity, partiality, and multiplicity of such relational spaces. Methodologically, the consequences are that it is important to consider where the designers position themselves and the artifacts in the network of relations, since different positioning will have different implications for the subsequent spaces of action.

ABSTRACT

The thesis discusses lessons learned and issues raised when exploring how self-produced rich media can facilitate sharing of meaning between healthcare professionals at an intensive care unit and between healthcare professionals and patients within a hand surgery clinic. Design experiments conducted at the intensive care unit focused on how healthcare professionals could collaboratively produce ‘best practice’ videos displayed on handheld devices and accessed through barcodes placed out in the unit. The making of the videos it is argued can be seen as a temporary convergence of different views when reifying ‘best practice.’ Design experiments conducted at the hand surgery clinic focused on how healthcare professionals and patients collaboratively could produce, during consultations, rich media documents that are tailored to the patients’ specific needs. The rich media documents made can be seen as a temporary convergence of two distinct practices; namely that of hand surgery treatment and the practice of everyday life. Making of rich media documents in both projects resulted in developing relational spaces of informal learning, which engendered the making of rich reifications that function well in close relation to participation. To engender the making of the rich media documents demanded the establishment and hardening of a socio-technical infrastructure which can be seen as a temporary convergence between tools and practices where both the tools and practices are changed. In both cases using these videos in turn demanded that the videos, a form of local collaborative hardenings, needed to be translated anew and so to speak “defrosted.” The design consequences are that designers need to acknowledge materiality as an ongoing process which is given meaning through participation over time within and across communities of practice. Materiality and human agency in this instance are not seen as discrete elements, but rather highly intertwined. The second design consequence is that we need to acknowledge the complexity, partiality, and multiplicity of such relational spaces. Methodologically, the consequences are that it is important to consider where the designers position themselves and the artifacts in the network of relations, since different positioning will have different implications for the subsequent spaces of action.
Socio-Material Mediations
Learning, Knowing, and Self-produced Media within Healthcare

Erling Bjarki Björgvinsson
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1 RESEARCH AREA AND RESEARCH QUESTION

This thesis in interaction design discusses lessons learned and issues raised in developing spaces for day-to-day learning supported by digital technology. The subject area for the thesis is thus the relationship between space, informal learning and information technology. Specifically, the thesis will focus on issues concerning how learning supported by information technology can become integrated in the day-to-day work of healthcare professionals and patient treatment. In doing so, it aims at connecting a discussion on space and place within the field of interaction design with actor-network theory and a sociocultural view of learning. The thesis will then proceed to discuss design experiments and explore how self-produced rich media can facilitate sharing of meaning between healthcare professionals within an intensive care unit and sharing of meaning between healthcare professionals and patients within a hand surgery clinic.

1.1 SELF-PRODUCED MEDIA WITHIN PROFESSIONAL PRACTICES

Recently tools and techniques for producing relatively advanced media have become available to non-professionals, spurring non-professional media production. However, few studies and design projects have focused on self-produced media within
professional practices and how they can support learning and knowing in daily work. That professionals can produce their own rich media opens up new ways of asynchronically communicating and mediating knowing gained through experience. That professionals themselves can produce their own rich media learning material means that the content can be packaged, mediated, translated and transformed in a different way than when professionally produced, which affects the content and how it is used. First of all, that the professionals can make their own media means that they can tailor the content to their specific needs to a greater extent, making the content more relevant and engaging. Secondly, they have greater control over the production and the transformative process that making rich media entails. Thirdly, making the rich media documents opens up creative and critical processes where aspects of the practice can be discussed and negotiated, which at times can lead to changed ways of working.

The everyday understanding of the word “media” is often currently associated with ways of communicating through “one-way” mass communication channels such as television, radio, newspapers, magazines, homepages, and so forth. Mediation, which points toward the act of mediating, means not only communicating, but also the act of negotiating, partaking in a dialogue, or talking to resolve conflicting views. Mediation in the latter instance defines mediation as reciprocal communication rather than one way communication, where differences are exposed and perhaps resolved. What I will argue is that mediation is precisely a two-way communication, but not only between two or more humans but an interactional endeavor over time involving both human and non-human elements.

Designing support and developing processes for self-produced media means precisely negotiating how new forms of mediation, partly human and partly non-human, can fit in with older, more established human and non-human ways of mediating within a specific work practice. Work practices mediate meaning not only through human performance in the immediate circumstance, although such mediation is highly important and central, but also mediate through the socio-material circumstances developed over time. Designing new forms of mediation is therefore relational, creating new forms of relational mediation between older forms of mediation, such as the meaning given to physical locations, legitimate established ways of communicating, and so forth. This means that designing technology support for self-produced rich media for a local professional practice needs to pay attention to the context or issues of space and place, or how such technology becomes part of the socio-material spaces within local practices. Thus I argue for viewing such media production and mediated communication as action spaces within local practices in turn within networks of human and non-human relations.
1.2 LEARNING, KNOWING, AND TECHNOLOGY

Learning and competence development within professional practices has for a long time been considered important. More recently it has explicitly been considered important that the learning become an integrated part of the work. Although learning and work have in many instances become more integrated, who does the learning and who does the teaching and provides for the learning material as well is often divided. IT companies dealing with learning, such as e-learning companies, have come to understand the importance of bridging the gap between learning and work to some degree, but often lean heavily on being content providers rather than facilitating in-house processes where content is created by the workers themselves. Neither many companies nor much research have looked into how it is possible to create interactive or computer mediated learning based on content made by the co-workers themselves, where co-workers learn from each other through open-ended learning processes and open content.

How learning and competence development should be approached, and more specifically how computer-based training can support learning and knowing, is debated and still a very open question. Binder (1995) points out that some have seen the solution as a matter of providing the right information at the right time and place. Others have advocated that the right approach is to make an efficiently parceled curriculum easily accessible at work, for example through distant learning platforms. In both instances it is believed that computer programs could reflect and replace the cognitive processes needed to carry out practical tasks. In both instances it is also considered unproblematic that the learner is allowed to engage in an isolated and purified learning process where he or she typically follows step-by-step procedures or at least highly structured and parceled learning packages, while competent action and work activities are essentially not carried out by following step-by-step procedures. Instead, work and competent action means that cognition and the situation arise and evolve as part of the activity that one is engaged in, as Suchman (1987) and a mass of work studies and computer-supported cooperative work studies have shown. Binder, however, points out that designers of computer-based learning, even when avoiding purifying learning by making it into a distinct activity separated from work, inevitably in some ways will need to structure that which is at heart situated knowing and competent action.

But if that which is situated cannot be structured and formalized, is there any place at all for computer-supported mediated learning? Can we think of computer-based learning as something else than mirroring cognitive processes and mimicking knowing? And if not mimicking, do structuring resources and formalizations as
in the form of computer programs and structured learning content have a place? Binder suggests that computer-based learning can be meaningful even if the learning resources are designed to structure specific learning processes, because how they actually will be used cannot be predetermined. Also, introducing computer-supported learning projects can be beneficial because they acknowledge the workers’ need for engaging in learning activities connected to their work. He therefore argues that we need to pay attention to how the introduction of computer-based learning can engender the formation of new social practices. But if we acknowledge that they can be valuable resources, he goes on to state, we need to ask how these resources can “gain stability in time and space, if they are fully embedded in the situated practice of a community. And second, through which social mechanisms can a repertoire of resources evolve and develop, and explain the growth of the overall competence of the community/profession” (Binder 1995, p.231).

The above-mentioned questions thus raise the issue of how the materialization of knowing or how computer-mediated learning and knowing that is in some way structured and formalized can play a meaningful role in relation to specific activities at work. This also points towards the issues of how such materializations relate to the larger social space of a specific work practice. Further, it points to the fact that we need to pay close attention to how new social practices emerge around such new material practices, and in particular how they gain stability in time and space and can play a part in developing knowing within specific work practices.

These questions of how to view materiality and how to avoid a strict sequentiality, and how new artifacts supporting learning and knowing can gain stability in time and space and contribute to moving practices forward are questions also central to the discussion on space and place within the field of interaction design. This discussion has, as I see it, had a strong focus on the relationship between materiality and knowing or meaning making or in other words how information technology and space or place of action relates. This in turn has demanded discussing how space and place should be defined. Essentially this is a question of what constitutes a space or place of action, which again relates to such issues as materiality and action, stability and change, homogeneity and heterogeneity.

1.3 SPACE, PLACE AND INFORMAL LEARNING

Research on computer-supported learning has been considerable, but has tended to focus on learning (even when designing for work practices) as a separate activity from work although building upon socio-cultural perspectives of learning. IT sup-
port for learning that is more fully integrated in the day-to-day concerns of work practices is rare, especially focusing on how professionals themselves can develop their own learning environments and processes, which can be used to facilitate their day-to-day work. In the field of computer-supported collaborative learning the move from the cognitive aspects of computing to the contextual issues has not been as apparent as in the field of computer-supported cooperative work, where social aspects of using information technology have been emphasized.

Contextual issues of computing have also been prevalent within the discussion on space and place within the field of interaction design. In recent years there has been a growing interest within the interaction design community in developing sustainable concepts around what space and place can mean in relation to the design of information technology. The interest in these concepts has risen out of the understanding that the use of computational artifacts is better understood if their context of use is understood rather than if just the activity between the user and the computer in isolation is studied. The shift from human computer interaction (HCI) with focus on the cognitive aspects of using computers to interaction design has broadened the field to include the social and situated aspects of using computers.

The need to discuss concepts of space and place has also risen from the fact that information technology has entered all domains of human activity. Research areas such as augmented reality (Wellner et al. 1993), ubiquitous computing (Weiser 1991, Weiser & Brown 1995), tangible interfaces (Ishii 1997), and contextual aware computing (Want et al. 1992) with its interest in how computation can go beyond the desktop computer and become part of physical spaces and physical objects has increased the need to understand space and place. Working within these areas means working with an extended design space where the relationship between the physical, the digital, and activity becomes central.

So far research on contextual-aware computing, as the interaction designer Ciolfi’s (2004) overview in the beginning of her dissertation Situating Place Within Interaction Design shows, that viewing context as something out there that can be easily captured in quantitative variables is quite difficult, since essential qualities of context are the social interaction, emotional and affective responses going on which cannot easily be captured by computers. Further research into media spaces, such as video conferencing, has shown how such mediated spaces affect sociability, sensing and collaboration and how bodily aspects of communication do not translate easily into such mediated spaces.

Harrison and Dourish (1996), who brought to attention the issue of space and place to the fields of HCI and interaction design, argued that space has to do with location and place with meaningful action. “Place is a space which is invested with
understandings of behavioural appropriateness, cultural expectations and so forth” (Harrison & Dourish 1996). Dourish (2001) later expanded his view on place, or what notions of context that can be fruitful to work with as a designer of digital technology in his book Where the action is – Foundations of embodied interactions. In the book he joins what he terms social- and physical computing with the term embodied interaction and points out how these two areas are concerned with the same issue, namely that of the context of computing. He defines context as the nexus of presence and practice, or in other words an engaged participation with the world. To him place is thus full of meaning, which is derived through direct engagement or participation with the world, which unfolds in time and space. Typically our engagement in the world that unfolds in time and space means continuously moving around and shifting attention, rather than being dedicated to a single location and a single focus of attention which follow a forced sequentiality. (Computation with the stationary computer on the other hand happens through a single point of control and tends to tie activities to a specific location, thus creating a forced sequentiality). The aim of those engaged in embodied interactions, on the other hand, is to make the interaction with computation distributed into the environment where the action is. Here interaction happens through various objects that are spread throughout space and where sequentiality is not enforced, but rather open-ended and multimodal.

Computation beyond the desktop or embodied interaction entails as Dourish (2001) points out new design concerns: How context becomes part of computation; how attention and the shifting between focal points is managed; how devices are combined, spread out in space and relate to the proximity of our bodies; how material and physical affordances can be exploited; and how the physical and digital relate. As such, central issues addressed within embodied interaction are similar to those facing designers concerned with computer-based learning within work practices. These issues are again how computation affects sequentiality, how objects are given persistent meaning and by whom, how the coupling between various physical and digital objects and activities is managed and how they converge and what boundaries are set up between the physical and the digital.

Thus phenomenological approaches to space and place within interaction design have been prevalent, emphasizing place as an embodied experience. Although this approach has enriched the discussion of space and place and its relation to the use of digital media, it often tends to create a divide between human agency and digital technology, viewing the digital as essentially disembodying and the physical and the analog as more embodied, and place as homogenous, deeply rooted and stable. This thesis proposes that the phenomenological approach can be enriched
and the dichotomies perhaps overcome by newer approaches to space and place that emphasize place as hybrid rather than homogenous, partial rather than holistic, negotiated and contested rather than stable, and open and extraverted rather than circumscribed and closed. In other words, I argue for a view of place as a social practice, which at the same time is embodied and discursive and materially or locally bound, but richly connected to other places and practices.

1.4 RESEARCH QUESTIONS

The main research questions are thus: First, in what way does location where experience and meaning making take on material and spatial form play a role in learning and knowing, and how can such informal spaces be supported with information technology? That is, how do information technology and media, informal learning and space intertwine? At the heart of the matter is how knowing can be transported, mediated and placed within practice as well as across practices. Questions addressed related to these main issues are: in what way does the materiality shape, influence, enable, and constrain the establishing of place for informal learning; how does the identity of place influence how technology supporting learning and knowing can be used and to what extent can the identity be negotiated and exceeded; what type of reifications of knowing and learning are useful; in what way are reifications transportable, or in other words, how site-specific are knowing and learning and the technology and process supporting them; in what way do old and new ways of learning need to co-exist; what processes are necessary to establish so that new ways of learning can become established and maintained, and how inscribed do new practices and artifacts need to become to become part of a more sustainable change in a practice?

These questions and sub-issues grew out of work on two research projects on informal learning within healthcare. The first research project, running from 1999 to 2002, focused on how mobile technology could support collegial learning at an intensive care unit. The project started out with quite an open-ended and broad agenda concerning what the project should result in. However, two central issues shaped the focus of the project from the start. The first issue was to explore how information technology could support experience-based learning. In other words, the project aimed at studying and designing for learning, which is not mainly about learning facts offline from day-to-day work, but rather learning that is closely related to issues of knowing in the daily work. The second issue that helped to shape the project was a technological agenda. The technological agenda was an interest in technology that goes beyond the desktop and becomes an integrated part of the
physical environment where the work is performed. The project in other words intended to explore in what ways new mobile technology could be meaningfully integrated into a work practice.

The second project, running from 2003 through 2005, also aimed at exploring how self-organized day-to-day learning between healthcare professionals and patients could be supported with information technology. Specifically, the project aimed at exploring this in relation to self-produced multimedia and how such material could support the documenting and collaborative reflection of experience gained from the daily experience of healthcare work. Thus the research project aimed to understand and evaluate the cultural, organizational, methodological and technical conditions for day-to-day learning between healthcare professionals and patients supported by self-produced mobile multimedia learning material. Further, it aimed at understanding how such learning material can support reflection and change within the practice. The project also aimed to develop and evaluate use scenarios concerning learning supported by mobile IT together with the end-users and industrial partners.

1.5 READER’S GUIDE

Chapter two describes the two practices, an intensive care unit and a hand surgery clinic, which participated in exploring new ways of learning and knowing with the support of new information technology and new media. Both practices are described as socio-cultural spaces with their distinct ways of formally and informally organizing their human resources as well as their physical environments. These practices also have their distinct ways of acting, talking and specific ways of using tools as part of their practice. Knowing is a collaborative activity achieved through ways of talking, ways of organizing both human resources as well as physical environments, and through the tools used. Although the two practices can be said to respectively work toward the same goal, each practice can also be said to consist of heterogeneous practices or formal and informal groupings of people who have different experience and knowledge of the various activities performed as part of the work. Developing the practices is achieved through attending to concerns that directly relate to practical concerns facing their practices, where new ways of organizing and the creation of new routines play an important role.

Chapter three connects socio-cultural notions of learning and knowing with notions of space and place within interaction design, actor network theory and feminist epistemology. I focus in particular on three issues, namely: what notions
of materiality can be fruitful to work with when designing new spaces for learning and knowing? Secondly, do notions of homogeneity or the notion of heterogeneity characterize spaces or places? Thirdly, what notions of stability and change can be fruitful to work with? The argument put forth is that a fruitful way to view space is that it consists of heterogeneous relations. Firstly, they are heterogeneous in the sense that human and non-human elements are intertwined where reifications are closely connected to participation. Secondly, space consists of heterogeneous trajectories or communities of practice within communities of practice. Thirdly, relational spaces seek stability, but a temporary stability, which is an ongoing achievement.

Chapter four, which focuses on the research approach, argues that the research presented is design research, which in this instance draws upon the tradition of Scandinavian participatory design, which in turn has drawn upon action research. What characterizes this approach is an open-ended exploration where designers and practitioners challenge each other’s views through an iterative process where staging new spaces for learning and knowing in the midst of ongoing work plays a central role. The starting point of such a process is the issues facing the particular practice engaged in the study. The chapter also presents an overview of how data was constructed in the projects through various significant activities. The chapter ends by discussing how the data has been interpreted by connecting it to debates within interaction design as well as other humanistic fields.

Chapter five discusses design experiments conducted at an intensive care unit around developing new processes of collegial learning through self-produced video. Through this project I argue that designing new ways of supporting informal learning can be seen as new relational spaces of meaning making where tools and practices converge and recursively affect each other. To engender the making of self-produced videos to be used by colleagues as memory aids, a certain amount of hardening of social and material as well as technical aspects was necessary. This hardening or establishing of socio-material infrastructure in turn engenders the making of the videos. The making of the videos in turn can be seen as a temporary convergence of different views when reifying ‘best practice.’ Using these videos in turn demands that the videos, a form of local hardening, need to be translated anew, and so to speak “defrosted.”

Chapter six discusses design experiments conducted at a hand surgery clinic focusing on patient learning. Specifically, the question was how a collaborative articulation of an injury or an ailment can be supported through the making of individualized, rich-media patient rehabilitation documents at the rehabilitation ward and the outpatient ward. Similarly to the intensive care unit project, I argue that
the new ways of supporting learning and knowing developed can be seen as heterogeneous relational spaces. To engender the making of the rich media documents on the fly during the ongoing work demanded the establishment and hardening of a socio-technical infrastructure which can be seen as a temporary convergence between tools and practices. Specifically, it demanded finding out where the recording equipment should be placed, what should be recorded and who should be involved in preparing and finalizing the rich media document. The different wards at the clinic, although belonging to the same work practice, are distinct relational spaces of meaning making, which to some degree demanded different forms of solutions. The rich media documents made, I suggest, can be seen as a temporary convergence of not only tools and practices, but of two distinct practices; namely that of hand surgery treatment and the practice of everyday life. This means that makers of the rich-media documents do not fully know each other, nor do they know in what networks the rich-media the documents may come to travel in. These rich media documents, just like the rich media documents at the intensive care unit, need to be defrosted by the patients in their home environment.

In chapter seven I conclude that the making of rich media documents in both projects has resulted in developing relational spaces of informal learning, which engender the making of rich reifications, which function well in close relation to participation. The design consequences, I argue, are that designers need to acknowledge materiality as an ongoing process which is given meaning through participation through time within and across communities of practice. Materiality and human agency in this instance are not seen as discrete elements, but rather highly intertwined. The second design consequence is that we need to acknowledge the complexity, partiality, and multiplicity of space. That space consists of simultaneous heterogeneous trajectories and an ongoing open-ended achievement. Methodologically, the consequences are that it is therefore important to consider where the designers position themselves and the artifacts in the network of relations, since different positioning will have different implications for the subsequent spaces of action. In addition, what the site is and which heterogeneous relations one will need to consider cannot be determined, but will be revealed as one goes along.

1.6 CREDITS

This dissertation, although credited to my name, is a highly collaborative achievement. The text builds on and uses parts of text material from articles written together with Per-Anders Hillgren, Thomas Binder and Eva Brandt.
The description of the hand surgery clinic builds on texts written by Per-Anders Hillgren and myself. The meeting between the physiotherapist and patients accounted for in the site description (p. 53 - 56) and the design experiment at the rehabilitation unit (p. 193 - 198) are heavily indebted to Per-Anders Hillgren's analysis, and published in Björgvinsson, E. And Hillgren, P-A. 2004. On the spot experiments within healthcare. Participatory Design Conference 2004.

The text on the making and using of video at the intensive care unit, (p. 157 – 164 and 174 - 188), is based upon and in some instance uses text from:


At large big parts of the text and the analysis is strongly indebted to Per-Anders Hillgren with whom I have closely collaborated with throughout both projects.
This chapter describes the two practices that collaborated in the projects discussed in this thesis. The first part of chapter portrays aspects of what it means to work and learn at the intensive care unit. The second part gives a picture of what it means to work at the rehabilitation and the outpatient ward at the hand surgery clinic and what it means to be a hand surgery patient.

The picture I give of the intensive care unit is that the staff highly appreciate learning and knowing that is intertwined with their day-to-day work where they at the beside can mutually exchange know-how by performing activities together. However, the staff also emphasized the importance of having a room for collaborative reflection upon their practice. Further I describe how the unit constantly needs to reinterpret and develop aspects of their practices, which is often done through developmental projects. I also describe how the intensive care unit, although on one level is a homogenous practice, consists of various formal and informal groups of people that have different experiences and know-how and belong to different competence areas. At last, I point out, that the practice configures and assigns meaning, both more permanently and fleetingly, to their work environment.

The picture I give of the hand surgery clinic is that the treatment of hand surgery patients is highly individualized and where the course of action to be taken is jointly articulated by the patient and the healthcare professional. I also describe
how the patients are often distressed and find it difficult to remember what has been conveyed during the visits. Further, I show how the patients find the transitions from the different ward and from the clinic to their homes stressing. Central aspect of caring for the patient is therefore to find ways to smooth the transitions between units and from the clinic to the home. I also describe how the rehabilitation and the outpatient ward, although belonging to the same practice, are organized differently both socially and materially.

Common to both practices is that learning, knowing and working are highly intertwined and they consist of various formal and informal areas of expertise and know-how, which partially overlap.

### 2.1 THE INTENSIVE CARE UNIT

#### 2.1.1 Project overview

The intensive care unit project, running between September 2000 and December 2002, researched into how mobile technology and new media could support learning and knowing connected to daily work. The project was a collaboration between the Creative Environment Studio at the School of Arts and Communication at Malmö University, the Space and Virtuality studio, Interactive Institute, Malmö, and the Intensive Care Unit, Malmö University Hospital. The size of the research staff varied depending on the different phases of the project, but mainly consisted of two interaction design researchers: Per-Anders Hillgren and I. From the intensive care unit, a core of nurses, nurse’s aides and physiotherapists participated, although the staff at large was generous with their time and took part throughout the project in different experiments. The nurse in charge of the competence development was the internal project leader at the intensive care unit and our link with the unit.

The Creative Environment studio at the school of Arts and communication at Malmö University and the Space and Virtuality Studio at the Interactive Institute both researched on how learning and meaning making relates to spatial issues; how interactive media technologies, space and activity interplay. Both studios had an interest in studying ubiquitous computing and augmented environments used for co-operative practices that stretch across multiple sites of interactions. Both studios have also emphasized the social aspects of creating shared understanding and meaning (partially) through technologically augmenting spaces and artifacts.

The intensive care unit contacted the School of Arts and Communication with the aim of involving the school in seeing how computer-based learning could support its competence development. In the beginning, they were interested in exploring
how their competence development could be enhanced through an intranet learning platform where the staff could study and test their knowledge on Intensive Care Unit procedures. The problem as they saw it was that it was difficult to establish a minimum competence in new work procedures amongst the 140 staff members. Testing competence through written tests and giving out competence licenses and certificates have become a wide spread practice within Swedish healthcare. Local units are often required by regulation to test their staff and prove to external stakeholders that their staff has acquired a required level of knowledge.

The research partners and the intensive care unit agreed upon approaching the unit’s concerns in a more open-ended fashion through a participative design process. This open-ended process meant that that there was no specific design solution or technology given in advance, that the initial concern could even be redefined, that several design possibilities would be kept open far into the design process and several different design outcomes would be explored simultaneously. A participative design process allowed the creation of a collaborative room for exploring, probing, staging and reflecting upon the issues to be explored. Here the staff and the researchers could challenge each other through staging and probing different kinds of scenarios on how new technology and media could facilitate learning and knowing.

The research project was divided into the following stages: (1) collaborative exploration of the workplace culture through ethnographically inspired studies and workshops, (2) iterative small scale explorative experiments in the midst of work, (3) exploration into new forms of work, (4) anchoring the project within the whole organization.

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Figure 1: Overview of the ICU - project.
The first phase of the project, running between September and December 2000, consisted of a field study at the intensive care unit through an ethnographically inspired study of the nurses and nurse’s aides work and of a series of three workshops. Each of these workshops was structured around a specific theme and aimed at creating distance amongst the staff by de-familiarizing their work practice through re-contextualization or re-location of their practice within other locations and other fictionalized practices. The aim of the field study was to get a rich picture of the nursing practices at the unit, rather than searching for problems that could be formulated as requirement specifications. At this stage it was important to have an open and broad focus and not narrow our field of study prematurely.

The second phase of the project, running between January and May 2001, focused on exploring different possibilities of supporting the sharing of meaning integrated through iterative small scale prototyping design experiments at the unit. Together with the staff we explored the possibility of making self-produced video that could be broadcasted in their own intensive care unit television channel, the possibilities of linking digital data out into their work environment, and an initial explorations of making and using contextual mobile and self-produced video.

The third phase of the project, running between August 2001 and June 2002, focused on how the staff could produce their own videos and how the videos could work in different contexts within the unit. Specifically we explored how the staff could make their own video without a complicated postproduction process, what character the videos should have, and in what circumstances they could be used and how they could be integrated into the ordinary flow of work. How these videos would be placed out in the work environment through physical links was also explored.

The fourth phase, running between January and December 2002, focused on studying how the research project could be anchored within the whole organization. Initially we formulated that this phase of the project would focus on exploring how the administration of a learning system could look like, that is, whether off-the-shelf technology could be used or if a tailored administrative system needed to be developed. Although these issues were attended to some degree, the project came to focus more on how the results could be spread and appropriated by all staff members at the clinic and how it could be placed within the organizational structure.

2.1.2 Work at the Intensive Care Unit

The project started out with a field study of the day-to-day work at the intensive care unit, which lasted between September and December 2002. The first part of
the field study consisted of informal interviews and a few days of observations at
the unit where we mainly observed the nurses during their work. The second part of
the field study consisted of two workshops where the staff became actively involved
in constructing images of their work (inquiries and a deepened understanding of the
practice continued and was a central part of the design phases and are to some de-
gree accounted for in this chapter). The aim of the workshops was partly to deepen
our understanding of the nurses’ and nurse’s aides’ view of their work practice and
partly discuss what type of artifacts and learning processes they would be inter-
ested in. Two workshops where held with a varying group of five to six participants
of nurses and nurse’s aides to discuss the relationship between knowing, artifacts,
and work. The first workshop addressed such issues as what functions artifacts
have in a social setting and what is their relationship to new locations. The second
workshop raised questions concerning learning and knowing at the intensive care
unit. The intensive care unit consists of two departments; the ‘general’ intensive
care unit and the post-operative department. Although the post-operative depart-
ment was part of the research project, what is described and discussed here is the
‘general’ intensive care unit. The description is also limited to the nursing practices
and excludes the physicians’ work and their ways of learning and knowing.

The general ICU, with a staff of 140 medical professionals, has a capacity to
care for ten patients. The staffing during a particular shift depends on the number
of patients and their condition. Most of the rooms have two beds. In some instanc-
es, a nurse with the assistance of two nurse’s aides can care for two patients. If a
patient’s condition is more serious the nurse will care for just that one patient with
the assistance of a nurse’s aide. Three physicians per shift are on duty at the ICU of
which one is a senior physician. The post-operative department at the intensive care
unit watches over and treats up to eighteen patients that have been operated on or
examined invasively. Patients usually stay there from a few hours up to twenty-four
hours before being transferred back to the clinic where they came from. There were
obviously a variety of causes that brought them to the ICU for care.

The ICU is a highly specialized unit staffed by ICU physicians, anesthesiolo-
gists, critical care nurses specialized in intensive care, nurse’s aides, physiotherapists
and a social worker. The unit, although highly specialized, treats various patient
categories belonging to different specialties and the reason for the patients’ need for
intensive care treatment therefore varies greatly. The broad range of patient cate-
cgories a priori requires the staff to have a very broad and varied knowledge base. This
shifting nature of the work fascinates, but also distresses the staff. The fascination
stems from the great variety of knowledge and skills required to treat the many dif-
ferent patients that need to be cared for in the ICU. What the staff found trouble-
some on the other hand was all the new procedures and routines that they needed to master including the procedures that needed to be followed in handling a vast array of medical technical equipment. During our observation, the patient rooms often changed from one day to another as new patients replacing patients from the previous day required new configurations of medical equipment that needed to be arranged around the beds.

The (general) intensive care takes care of patients needing assistance with life-sustaining functions such as circulation and respiration. Although the patients are critically ill and need close attention, their condition is usually stabilized. This means that alterations in the treatment frequently do not have to be done immediately; rather the staffs has in some cases even hours to prepare and set-up the medical equipment and prepare medicines. In other words, caring for an intensive care unit patient does not mean that the staff is constantly in a state of acute emergency fighting for the patient’s life, although obviously such incidents do occur (clearly, in such states of emergency, IT-support for informal learning is not possible and relevant).

Caring for an intensive care patient means often that little or no direct communication with the patient is possible. The patients are often unconscious, sedated, or intubated, which means that the staff needs to draw upon other resources other than conversing with the patient for their assessment of the patient’s condition. The nurses pay close attention to the color of the patients’ skin, their smell, and examine the patients’ body. Often the patients’ are connected to an array of medical technical equipment and some of the nurses found that it sometimes was difficult to see the person behind all the equipment and the “snake nest” of cables. However, they emphasized the importance of close physical observations and tactile cues, rather than focusing too heavily on all the information generated from the monitoring equipment. Reporting from one shift to another, besides writing in the electronic patient journal, would often include a show and tell of the patient, where the nurses would describe next to the bed how the patient felt, looked and smelled. During these sign-outs, they highlighted to each other areas of concern. Furthermore, to
get a better picture of the patient’s condition, the staff would talk with the nearest relatives to find out how the patient was before becoming ill. For example, if the patient normally slept uneasily. Also, relatives were asked how they looked before becoming sick and even asked to bring pictures of the patient prior to the illness so that the staff could reference how the patient normally appeared.

Working at the intensive care unit requires the staff to handle a vast amount of medical technical equipment such as reusable resuscitators, Continuous Positive Airway Pressure (CPAP) apparatuses, Maxin nebulizers, Nimbus mattresses, syringe pumps, respirators, transport respirators, Clinitron beds, patient monitor equipment, ECG recording devices, bladder scanners, bronchoscopes, boosters, pleural suction devices, and so forth.

Handling medical technical equipment is distributed between the different professions and individuals at the clinic. Treating patients with the CPAP, an apparatus that facilitates breathing, is foremost performed by the unit’s physiotherapists. The physiotherapists, however, work only morning and afternoon shifts, which mean that the nurses frequently need to handle the CPAP machine as well. In other words, the nurses need to handle equipment that belongs more to another professional domain. Handling the bronchoscope, which is used for examining the airways, is also distributed across professional domains. Bronchoscopy is done by the physicians, but the disinfection of the equipment is performed mainly by the nurse’s aides. The nurses are also expected to know how to disinfect the equipment, but perform the task less frequently than the nurse’s aides and are therefore less familiar with how to perform this task. Handling medical technical equipment at the unit is also distributed between individuals where certain individuals become experts at handling specific equipments. This type of distributed responsibility is more informal. At the unit, it was well known that certain nurses and nurses’ aides were experts on disinfecting the bronchoscope, that one of the physiotherapists was and expert on the CPAP-apparatus, and that two nurse’s aides were experts on patient transport to other clinics and specifically patient transportations involving the transportation respirator. How well the nurses and nurses’ aides know how to
handle certain equipment also depended on when they started working at the clinic or what has happened while they were away on leave. While on leave they may have missed hands on introduction on how newly acquired infusion pumps function or how a booster is connected to the respirator for example.

Handling medical technical equipment is not simply a technical activity. Knowing how to handle the equipment means knowing what it does to the patient, what one should be observant of during its use and how it relates to other treatments. Furthermore, medical technical equipment can be used in many different ways and knowing how to use the equipment demands also knowing what treatments are preferred by a specific physician or physiotherapist at the unit. Handling competently medical technical equipment also relates to the specific material circumstances at the clinic, which demands having experience of how a particular device connects to and works with other medical technical equipment and the physical organizations and the limitations set at the unit and some cases at other unit’s that the patient is temporarily transported to.

Using the transportation respirator confidently and securely, for example, demands considerable experience. Because the patients are critically ill, the staff is keen on ensuring that any transportation be done smoothly and that unforeseen incidents are kept to a minimum. Generally speaking transporting ICU patients to other units is cumbersome. The staff involved needs to know which elevators to take, how to navigate the type of bed that the patient is in as well as the medical devices that the patient needs into a usually too small elevator. Taking care of
the transportation respirator during transportation further complicates a task that requires experience of not only of how the transportation respirator works, but also knowledge of the physical circumstance that prevail at the clinics to which the patients are brought. Transporting a patient to angiography at the heart catheterization suite, the gastro-lab at the endoscopy suite, for CT at the X-ray clinic, the operative suite, infectious disease clinic are all tasks that require knowledge of the different circumstances present at each clinic. One of the main concerns of the staff is to make sure that there is adequate oxygen and ventilation for the patient during transportation. For example, because the X-ray clinic does not have extra wall sockets for oxygen and therefore existing equipment there needs to be disconnected from the oxygen supply source before the transport respirator can be connected to this outlet. Furthermore, the ICU staff involved with transporting the patient there often needs to wait outside the medical examination room where there are no wall sockets for respirators. Incidents have occurred at the unit where the staff has had to run back to the clinic to get extra tubing because they have not been familiar with the specific circumstance prevailing at the visited clinic. As the ICU takes care of critically ill patients, complications such as running out of oxygen and ventilatory support during transportation need to be prevented under any circumstances.

Two nurse’s aides at the unit are involved in most of the transportation and have become quite experienced transporters. Similarly the physician staff is well acquainted with where the outlets for the oxygen are at the x-ray unit. However, problems arise with physicians who work less regularly at the ICU and thus, due to lack of experience, they are less familiar with the specific details of the material circumstances that are present at other clinics and units. This problem is also present with the nursing staff and is a cause of concern and stress. Handling the transport respirator cannot therefore be seen as an isolated task. It is in fact a task that requires knowledge of how the transport respirator relates to other equipment, the physical organization of other clinics, their work routines, and not least, how these matters relate to the patient’s condition.

The organization of patient transportations affects the way that knowledge is distributed and shared at the unit and this has its strengths and weaknesses. The strength of this organization is that a few staff members have become experts in certain tasks and they feel secure performing these mundane albeit demanding tasks. On the other hand, this makes the unit dependent upon the presence of these experts. This was pointed out by the two nurse’s aides who were the experts on patient transportation. In their opinion it would be for the unit’s best interest if their specialized knowledge would become wide spread at the ICU. At the same time it is difficult, perhaps even impossible, for all staff members to become experts in all
areas and tasks. This is partly because the areas of expertise are diverse, but also because certain tasks are performed rarely. Transporting patients to the X-ray clinic for example may occur twice a week, but at times a month can pass by without a single patient transportation.

Handling medical technical equipment at the unit thus on a formal level is divided between different professionals. This results in one group becoming more adept at a particular task and as such how they handle a particular task involving the particular equipment that is their expertise might be quite different from another group who might be less versed in performing the same task. At times, a medical technology that is the main responsibility of one particular professional will become the responsibility of another professional who does not usually handle the equipment. More informally, although all nurses and nurse’s aides are expected to be able to competently use all medical technical equipment as part of their nursing practice, in reality, some members become more experienced and knowledgeable of use of a particular technology. This experience includes not only the equipment alone but how it relates the material circumstances prevailing at the unit and outside the unit. The experience and knowledge of the different professions, groups and individuals at the unit is therefore quite variable.

### 2.1.3 Physical organization

The general intensive care unit’s physical organization is divided into eight areas: patient rooms where four are general patient rooms and four are patient isolation rooms, the administrative area consisting of three rooms, the storage area consisting of three rooms for storing medical technical equipment and medicines, a coffee room, an expedition area consisting of two rooms, a visitor’s room, a room for the grieving families of the passed away, and study rooms which include a small library and two small cubicles.

The physical organization is related to how the work at the intensive care unit is organized and this affects how activities can be conducted. Most of the general patient rooms accommodate two or three patients, while the isolation rooms accommodate one patient. In most cases, a nurse cares for two patients, but at times cares for only one patient because of the patient’s serious condition. One ‘general’ patient room is therefore staffed by one to two nurses and one nurse’s aide assisting one or two nurses and attending to two or three patients. If a patient is severely ill, then at least one nurse at all times is required to be present in the room. The nurses are therefore assigned to a specific room, while the physicians are not bound to a specific room, but treat all patients in the unit. Two nurse’s aides have corridor
duty and they jump in to help as needs arise. The fact that general patient rooms accommodate two or three patients means that two or more activities are going on within the same room and need to be coordinated. The coordination includes having overview of each other’s work, helping each other out or covering temporarily each other’s patients and making sure that one’s activities do not disturb unnecessarily the other nurse’s work and the patients’ need for rest.

Within healthcare, the issue of privacy is central, and this becomes manifest in the physical organization and activities at the intensive care unit. The intensive care unit is a closed unit meaning that relatives visiting have to ring the door bell to be let in. Specialists and other staff from other clinics can on the other hand enter through the “backdoor” on their own. Patient rooms are similarly restricted and are at all times kept closed. The signs on the door to patient rooms are coded. A centrally placed whiteboard providing for an overview of the current patient status is also coded so that visitors cannot observe who is admitted and must therefore navigate to the right patient room with the aid of the staff. The staff’s access to the different patient rooms is also restricted. Only those working with the patients are allowed to enter the rooms. In other words, staff not caring for or temporarily assisting in the treatment of a patient is not allowed to enter into this patient’s room. Similarly, the staff is not allowed to read the medical record in patient journals of patients who they are not caring for. Another reason for restricting the access to patient rooms is the need for establishing a quiet and calm atmosphere.

Most of the rooms at the intensive care unit, although designated for one function, are used for various purposes. Patient rooms can be turned into offices, lecture rooms for introducing new medical technical equipment, and storage rooms. The coffee room similarly is temporarily turned into a meeting room at the beginning of every shift where the status of the unit is reported and the nurses are assigned to their respective patients. What the different locations mean and what social functions they are given is in some ways open for redefinition and cannot be said to have a static function or meaning.

The physical surrounding also plays an important role in the daily treatment of the patients where the staff continuously reconfigures the patients’ surroundings. This ranges from more permanent configurations such as the placement of a chart with shortened instructions on how to mix pharmaceuticals that is tailored for their daily work next to the table in a small room adjacent to patient rooms where medicines are typically mixed. There are also more fleeting and on-the-spot creative solutions made up when treating a patient. At the ICU, explicatory messages such as “Obs! The strength” or “Morphine,” taped on the medical technical equipment, are frequently seen. When we asked the nurse in charge of competence development
if there was an information war going on at the unit, she answered that they had discussed if they should minimize information posted on the walls to make the unit more presentable and less cluttered. However, these seemingly mundane communication artifacts are important features when configuring the often technically dense surroundings of the patient. All in all, the staff used a lot of contextual information such as labels, short instructions, reminders, and binders that are strategically placed where most needed in close proximity to where the particular task is carried out. These activities are reminiscent of design activities and perhaps not so far from the issues of designing spaces for action and reflection.

2.1.4 Location, artifacts, and social relations

During the field study it became clear that the nurses and nurse’s aides associated different meanings and social functions to different locations in the unit and considered certain technologies to belong more to one location than to another. Discussing the social qualities and roles of different artifacts with the nurses and nurse’s aides at a workshop, it became clear that the staff appreciated foremost artifacts which sustained tradition and engendered discussions. The daily information folder placed in the coffee room was such an artifact. The information posted in it, such as new work routines, was an important point of reference and engendered many discussions carried out in the coffee room. This was in line with what we had observed earlier. Lively discussions were frequent in the coffee room and at many times, the discussions circled around new topics posted in the daily information folder, such as the posting of a new routine concerning nursing infants. The coffee room was thus seen as an important space for sustaining tradition as well as a space

Figure 5: Fleeting on-the-spot messages were frequently used to communicate in the technically dense environment.
where the staff could critically reflect upon current practices and changes to this practice.

During the workshop it also became clear that the nurses and nurses’ aides saw computers mainly as administrative tools belonging to the administrative part of the unit. One participant, however, thought that computers could be used for a variety of purposes and could be placed all over the unit - every patient room and even carried around by all staff members. But most of the participants had a difficult time seeing computers as something else other than an administrative tool. Regarding the computers’ social function, the participants stated that it was mainly a tool used individually. Collaborative use of computers was restricted to reading over a colleague’s shoulder, and the social function it had was limited to reading what a colleague had written in the electronic patient record.

When we inquired if videos cameras could be a useful tool within the unit, the participants answered that it could be used for documentation by the nurse in charge of competence development. The nurse had recently introduced a digital camera and a video camera to the unit. They pointed out that the video camera could be used at various locations and in a range of social situations. The camera for example could be used for documenting ‘offline activities’ such as case seminars and heart lung resuscitation exercises as well as real work activities. The participants, however, associated the use of video cameras strongly with the nurse in

*Figure 6: Discussions in the coffee room on current and new work routines were frequent.*
charge of competence development and did not think that others at the clinic would find it useful.

The discussion with the nurses and nurse’s aides at the workshops revealed that the nurses, although valuing the discussions in the coffee room, located the most meaningful forms of learning and knowing in the patient rooms. One of the nurse’s aides stated that much knowing is generated in the patient rooms during day-to-day work, but seldom acknowledged, taken care of and spread at the unit. Although the patient rooms were a green house, a formidable place for cultivating knowledge, it was a closed room where the experience gained did not travel beyond the encapsulated glass walls surrounding it. The patient rooms were seen as the central location for learning. The learning that took place in these rooms was highly intertwined with the work that took place in them.

2.1.5 Learning and knowing at unit

Intensive care nursing practice is under constant change and demands considerable competence development even on a day-to-day basis. To help nurses adapt to these constant changes, they are allowed three of eight working hours per day to engage in competence development. Although the unit in practice often was unable to allocate three out of eight hours to competence development, it had an array of competence activities. These included external and internal lectures, teaching during the doctors’ rounds, case-seminars where specific troubling patients’ cases were discussed, and courses in handling new medical technical equipment. Furthermore, several developmental projects engaged a number of the staff members. One group worked with developing new ways of securing nasogastric tubes to patients with adhesive tape, another had developed and re-developed a patient supervision sheet for several years, and yet another group worked on documenting and developing new wound treatments.

The unit wished to promote competence development across professional borders, but had not accomplished this to any large degree. Teaching rounds during which the doctors taught both the nurses and nurse’s aides were appreciated by them, but this was not to any large extent an opportunity for exchanging experiences across professional borders. The case seminars, on the other hand, were learning opportunities where doctors, nurses and nurse’s aides could reflect upon their practice across professional domains. However, the manner in which the case seminars should be conducted and what should be focused on was up for debate between the different groups involved. Some of the doctors felt that the nurses focused too little
on the medical issues and the discussion would too often circle around emotional aspects of the treatment.

The nurses and nurse’s aides both during the workshops and informal interviews stated that they highly appreciated learning during their day-to-day work. “You don’t know that you know it until you have performed it in an actual situation,” one of the nurses stated. Another nurse further said: “You do your job and at the same time gain experience. It isn’t real until you stand there [in a real situation] and it is first at that time that you learn it properly.” While observing the nurses and nurse’s aides in their daily work, it became apparent that they drew upon each other as learning resources, assisting each other when uncertain of how to perform a particular task. One of the nurses was very conscious of this and stated that he usually went to one of his colleagues when unsure of how to use a particular piece of equipment because he found the manuals too thick and cumbersome to use. This type of practice-based learning, which is situational and oral rather than textual and ‘off-line’, was highly utilized by the staff. Assisting a colleague in a real situation did not demand abstracting the context; instead they used the context of a work situation to assist them in learning about aspects of their work that they needed to gain knowledge on.

Although learning as part of the day-to-day activities of caring for the patients was one of the main methods of learning used by the staff, there were other forms of learning such as informal discussions in the coffee room and developmental projects that were utilized by the staff.

During the second workshop, arranged as part of the field study, we had the opportunity to gain insight into the nurses’ and nurse’s aides’ view of how knowing at the unit is cultivated, taken care of and spread, and what it means to “produce” knowledge. The workshop on learning and knowing pointed out that the staff considered themselves good at generating and producing knowledge through the various projects instigated at the unit, but that they found transforming the results into written form demanding. Further, they called attention to the fact that the knowl-
edge gained from the projects undertaken in many cases did not spread well enough within the unit.

The workshop participants, stated that it was the unit’s policy that everyone should have the opportunity to start new projects and that the nurse in charge of the department strongly encouraged such initiatives. New projects were, however, often instigated by the head nurse. She for example had started the case seminars. Other projects were also initiated by the nurse in charge of the unit’s competence development. They also stated that new projects came about after visiting other intensive care units within Sweden and abroad. However, even though they appreciated that they had the opportunity to take part in internal projects, they underscored that at times there were too many projects going on. The problem being that the staff felt that they did not have the time needed to cultivate what had been already been initiated.

The workshop participants further pointed out that the existence of the projects spreads well, even to other units. The general opinion at the hospital was that the unit ran many interesting projects. The knowledge generated from the projects, on the other hand, did not spread well enough within the unit. One workshop member suggested, as a solution to this problem, that the unit should have advertisements running on the television in the coffee room that informed the unit’s staff about projects running and project results. The opinion that knowledge and experience did not spread as well as the staff wished had also been brought up during the first workshop. There it had been stated that the Daily information folder needed a megaphone so that knowledge from it could be better spread. In particular, the participants felt that the head nurse had a central function in spreading knowledge and clinical pearls to the ICU staff. Another problem with the internal projects was that it was demanding for the staff to write-up the results and findings gained. This included such things as guidelines, instructions or reports. It was easier to share the results orally than in written form and the staff felt that they needed a dedicated author who could translate the findings of the projects into a written format. The workshops brought attention to the fact that the unit had a strong tradition of instigating and running their own projects but that authoring and spreading the results could be improved upon.

The constant changes in how tasks were carried out required the ICU staff to have ongoing adjustments to their routine and work environment. There was a steady need for a re-articulation and development. Although the staff had pointed out the value of learning at the bedside and that composing written routines was time consuming and difficult, an important part of developing the work at the unit was through the writing down of local routines and procedures which described in
considerable detail how a specific task should be performed. There were also other
types of locally made documents such as shortened versions of instruction manuals
on medical technical equipment and on how to mix pharmaceuticals that were tai-
lored to the staff’s’ daily needs. The patient monitoring sheet was internally created
to fit their unit’s way of working and had been under constant revision since it first
version appeared 1996.

The Swedish statutes for the healthcare sector give local clinics and units consid-
erable autonomy, which in turn demands that every clinic develop their own local
routines. The statute for instance states that clinics have to develop local routines
concerning the administration of medicine: which medicines can be kept outside
the pharmaceutical storage room, who should have keys to the room, how medical
waste is handled, and how locally tailored diluting schemas are made. Descriptions
of work routines are published in a national handbook, which is available through
the internet. The handbook gives a general description on how specific routines are
to be performed, but often needs to be adjusted to local needs. The intensive care
unit at the University Hospital in Malmö has over one hundred local routines. Re-
cieving patients from other units, the ICU also uses other clinics’ local routines such
as the routines from the transplantation clinic on how kidney transplant patients
should be cared for.

Local routines can come about for different reasons. Sometimes, this is because
a staff member has needed but has not found a routine when confronted with a task
or because of an incident at work. In both cases a request for the development of
a new routine or that an amendment should be made to an existing routine is sub-
mitted to the nurse in charge of the local routines. She in turn delegates to a staff
member the responsibility to collect data that becomes the basis for establishing in
written form the new routine. The time it takes to develop a local routine depends
on how extensive it is, how complicated it is, and if it has a high or low priority.
Some local routines demand that a study, in some instance involving all the differ-
ent profession, be conducted, while others are authored after simple data collection
from other clinics and medical literature. Before publishing the local routine, staff
members are asked to comment upon them and finally the senior physician exam-
ines it and if found sufficient, he or she signs it. In more or lesser degree, the differ-
ent ways of developing a local routine is an opportunity to enquire closer into how
a procedure is currently conducted, how other clinics carry out the procedure, and
what has been written about it in medical literature. The developing of local rou-
tines are therefore not only a study and sharing of knowledge across competences
within the clinic, but also knowledge sharing across different clinics.
The intensive care unit applies other clinics’ local routines since it often takes of patients from other clinics that require intensive care. For example, patients treated for pulmonary embolism are vascular clinic patients, but are sometimes treated in the ICU because the thrombolytic medicines that are used to treat the thromboembolism is associated with a high risk of internal bleeding and hemorrhage. The intensive care unit follows the vascular clinic’s routines when preparing the patient for treatment. The routine requires that a Foley catheter be placed into the urinary bladder of all such patients. Several nurses in the ICU questioned the necessity of this since the treatment carried out at the intensive care unit only lasts about two hours. If a local routine is repeatedly being questioned, then its purpose loses meaning and this in turn requires that an enquiry be made into why such a routine practice is needed or whether changes need to be made to this routine.

In this case, the inquiries from the ICU staff lead the nurse in charge of local routines to contact the head of the vascular clinic that had authored the routine placement of Foley catheters in patients being treated for pulmonary embolism to find out why all such patients needed such an intervention. This revealed that it was a general routine for all patients being treated with thrombolytics to have placement of Foley catheters because some thrombolytic interventions took place over a long time span.

This led the ICU nurse to contact the cardiology clinic. The cardiology clinic gives patients suffering from acute myocardial infraction a short and intensive thrombolytic treatment which is similar to the treatment given to patients with pulmonary embolism in the ICU. It turned out that none of the cardiology patients required a Foley catheter. Upon learning this and seeing the similarity of treatments for patients with acute myocardial infractions and pulmonary embolism, the vascular clinic decided to amend their routine. They decided in writing that in cases of short and intensive thrombolytic treatments, Foley catheters to the urinary bladder were not needed. The development of the local routine for patients with pulmonary embolism exemplifies how the development of routines is dependent upon performance of actual work. It is through taking part in the day-to-day work that the shortcoming of a routine is revealed and changed. As such, in order for documents such as routines and instructions to be meaningful, their specifications are dependent on the local context of a practice.

2.1.6 Summary

Working at the intensive care unit requires its staff to engage in a complex practice where responsibilities are distributed between different professions. At the
same time, there is considerable overlap between the responsibilities carried out by these groups. At times, the nurses need to perform activities that are usually the physiotherapists’ domain. At other times, they need to perform activities that are usually done by the nurse’s aides. The complexity of the work within the ICU makes it necessary to distribute areas of responsibility between competence groups that in turn become more knowledgeable and experienced in their area of expertise. The complexity of work within the ICU is also due to the diverse patient categories treated there. As a result, some patient categories, being more rarely encountered, become areas of practice that are difficult for the staff to build up experience in caring for these patients, and using the associated medical technology that is needed for their treatment. Knowing and experience of certain activities are more informally distributed when certain individuals become more experienced in performing activities such as transporting patients. This competence does not belong officially to one profession or a competence group but becomes established as such due to the ongoing practice of dividing work activities amongst the staff. The unit, although a unified practice working toward the same goal, consists of various formal and informal groupings of people that have different experience and know-how of the various activities performed in the unit.

The unit has various activities that promote competence development such as competence groups, developmental projects, and case seminars. The type of learning and knowing that the staff appreciated, and acknowledged as their primary way of learning, was the learning that took place at the bedside, the learning that takes place with actual work. This type of learning is collegial and oral. Colleagues help each other out at caring for patients and at the same time gain new insights and knowledge. These situations of mutual exchange help point out to the staff what aspects of a practice routine need to be addressed and highlighted. At the same time, the staff emphasizes the importance of sustaining tradition through collaborative reflection of their work. The staff appreciated artifacts and social situations that engendered discussions. The computer was viewed as an administrative tool for individuals rather than a platform from which dialogue and discussion can be engendered. *The daily information folder* was considered to be an important platform for discussion partly because it was placed in the coffee room, which was viewed as an important meeting point for discussions. This re-iterates the fact that the relationship between artifacts, location and social situation are intertwined.

The unit had a strong need for, and an established tradition of, supporting its own development. Competence groups focused on specific areas in need of constant improvement and as such developed the practice within the unit. The need for redevelopment and change in some cases was due to external demands, but in many in-
stances the need for change was instigated by the staff themselves because they were displeased by the current ways of performing specific tasks. When developing their practice, the staff started by studying how their current activity was conducted and in some cases setting up a study to explore alternative methods and practices. The staff would contact other practices, get in touch with medical companies, reference medical texts and journals and online databases to gain knowledge in the area under question. What characterized these activities of redevelopment was the need to reinterpret the work practice within the unit while simultaneously appropriate and reinterpret information gleaned from other clinics, the national handbook, or manuals on medical technical equipment. This process of redevelopment was always in close alignment to the local circumstances and needs of the unit. The new ways of working and new routines thus developed were not seen as definitive, but temporary solutions that constantly needed to be redefined or changed.

Lastly, practice within the unit configured and assigned meaning, both permanent and temporary, to their work environment. More permanent configurations included the placement of guidelines in the vicinity of the work activity. Temporary configurations such as taped short text messages that aimed at drawing colleagues’ attention to a particular aspect of a routine were also seen. These activities of configuring, whether permanent or temporary in nature, were constructed so as enhance the ongoing activity of carrying for patients and can be seen as spaces for action and reflection. Regarding assigning meaning to different locations, the nurses and nurse’s aides considered the coffee room to be a place for collaborative reflection. The patient rooms, on the other hand, were also considered to be place for collegial exchange but here, the mutual exchange of knowledge occurred through performing patient care activities together.

2.2 THE HAND SURGERY CLINIC

2.2.1 Project overview

The research project Day-to-day Learning within Healthcare with the Support of Mobile IT ran between January 2003 and December 2005. The aim of the project was to understand and evaluate the cultural, organizational, methodological, and technical conditions of day-to-day learning between healthcare professionals and also between healthcare professionals and their patients, supported by self-produced mobile media learning material. Furthermore, the aim was to understand how such learning material can support reflection and change within the practice. Finally the project aimed to understand and evaluate what stakeholders, tools, and
processes are needed for the healthcare practices to evolve. The aim of the research project was thus to focus on both workplace learning and patient learning and their relation to self-produced media and a specific work practice.

The project was a cooperation between the School of Arts and Communication, Malmö University, the Interactive Institute, the Hand surgery clinic at Malmö University hospital, Anoto (a developer of digital pen technology), Guide (an IT consultant), Knowledge Partners, and Sigma Education IT consultants who focus on e-learning. The research project was driven by an ethnographically inspired field-study as well as cooperative design workshops with researchers, representatives from the participating companies and a group of staff members representing the different wards and employees at the hand surgical clinic. The group had stable core members as well as occasional participants. Furthermore, the project was driven by design experiments in the midst of the ordinary flow of work at the hand surgery clinic. The following table gives an overview of the project’s phases:

<table>
<thead>
<tr>
<th>Phase 1</th>
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<td>Broad initial explorations of new ways of supporting healthcare work through self-produced media</td>
<td>Field study of the clinic and patient treatment processes</td>
<td>Design explorations through a collaborative workshop</td>
<td>Pilot study exploring making and using self-produced media at the rehabilitation and the outpatient ward</td>
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The first phase of the project, running between February and May 2003, consisted of exploring new ways self-produced video could be relevant within healthcare. We knew from Continuous Learning within Healthcare that self-produced video was useful for collaborative meaning making and sharing within one practice, but wanted to know if there were other areas where this technology could be applied. The overall aim of the seminar was to explore how the results could be used and
further developed within other healthcare areas. A half day seminar was prepared and arranged on how learning within healthcare can be supported by new information technology. The seminar was targeted towards healthcare professionals in charge of competence development at strategic and clinical levels and researchers studying learning within healthcare. A total of fifty healthcare representatives attended this seminar from hospitals all over Sweden. The seminar pointed out that it could be highly relevant to explore how self-produced media could support healthcare professionals in their communication and learning processes between clinics and between institutional care and non-institutional care as well as between health care professionals and patients cared for at home.

The second phase of the project, running between February 2003 and September 2004, consisted of a field study divided into two separate activities and foci of attention. The first part of the field study, running between May and June 2003, consisted of a workshop where the hand surgery clinic presented an overview of their clinic. The workshop was followed by an ethnographically inspired study of the hand surgery clinic. We video recorded one to two shifts of work at the outpatient ward, the patient ward, the rehabilitation ward, the operating theater, and the secretariat. The researchers alone as well as with the staff members of the hand surgery clinic analyzed these recordings.

The second part of the ethnographically inspired field study, conducted at intervals between September 2003 and September 2004, consisted of the video recording of two patient treatment and rehabilitation processes. One was a planned minor operation for the treatment of a child. The other patient was a trauma case demanding immediate care, several operations, and a long and complicated rehabilitation. The focus of attention in both cases was the meeting between the patients and the health care professionals caring for them with the aim of getting a better understanding of what it means for patients to undergo extensive treatment and rehabilitation.

The third phase of the project, running briefly during the month of October 2003, consisted of planning and executing a design oriented workshop exploring various design openings that could be explored at the hand surgery clinic in relation to the technical possibilities available. The workshop participants were presented with technological components that could support the production, editing, accessing and usage of self-produced media and how newer technologies have made it possible to merge these traditionally separate phases of media production. Scenarios developed and presented to the participants at these workshops were on how video documentation could support communication regarding patient treatments between clinics, how patients could share their experiences and practical tips with
the staff and other patients, on how individualized instruction media to patients could be made, and on how a better insight into the forthcoming treatment process could be given to patients via this technology.

The fourth phase of the project, running between November 2003 and March 2005, focused on design experiments at the rehabilitation unit and the outpatient ward centering on supporting the treatment and rehabilitation of the clinics at the clinic through self-produced patient media. This phase of the projected concentrated on how the healthcare professionals could produce media specifically for individual patient during patient encounters.

The first part of this fourth phase, running mainly between November 2003 and March 2004, concentrated on exploring the making and using of individualized rehabilitation videos made at the rehabilitation clinic for patients to use at home. The following autumn, after exploring where the recording equipment should be stationed, the physiotherapists continued on their own to make these individualized videos.

The second part of the project’s fourth phase, running between April 2004 and March 2005, focused on exploring how the staff at the outpatient ward could produce and how patients could use individualized information and training material. At first we explored filming parts of early patient consultations, but ended up focusing on how these early consultations could be supported with orally and graphically annotated X-ray films. Additionally, we explored how nurses could make instructions videos that patients could use on their own at home. These design experiments conducted in the midst of the ongoing work at the clinic were continuously evaluated by the staff, patients, and project members, both at the clinic, through telephone interviews and through collaborative workshops.

2.2.2 Work at the hand surgery clinic

The hand surgery clinic at Malmö University Hospital serves a population of about 1.5 million people in southern Sweden, and all major upper extremity traumas from this region are referred to the clinic. The clinic receives six thousand patients each year. It has a steady intake of new patients throughout the year, but acute cases peak during the month of May. The largest patient group treated at the clinic is men. Twenty-five percent of these patients are trauma cases and fifty percent of these traumas are work-related incidents (one third of all work related injuries in this demographic are hand injuries). The clinic staff includes hand surgeons, nurses, nurse’s aides, physiotherapists, occupational therapists, social workers, a craftsman, and administrative personnel - a total of one hundred employees.
The clinic performs everything from small elective hand operations to large reconstructive hand operations demanding microsurgery, which the clinic specializes in. There are four units at the clinic on four different floors: the surgical ward, the patient ward, which has nineteen beds, the hand rehabilitation ward and the outpatient ward. This chapter focuses on describing the outpatient ward, the rehabilitation ward and central aspects of what it means to be a hand surgery patient. Circumscribing our description to the outpatient ward and the physiotherapists’ work at rehabilitation ward is due to the fact that the design explorations, which are the main concern of the thesis, where conducted at these two wards.

2.2.3 The outpatient ward

There are four surgeons, four nurses, and two nurse’s aides who work at the outpatient ward per shift. Additionally a consultant physician whose main responsibility is taking care of new smaller acute cases, a head nurse in charge of patient and staff administration, and an surgery coordinator work at the outpatient ward. The nurses and nurse’s aides are permanent staff and do not rotate between the different wards. Four surgeons rotate through the outpatient ward. A surgeon and one nurse or nurse’s aide assigned to this specific surgeon make up a team during a shift. All the nurses and nurse’s aides are qualified to handle all incidents related to their profession. However, some are known to be experts in specialized areas of work such as plaster casting. The staff is flexible and covers each other’s specified work domains if the situation so demands. Two nurses or nurse’s aides have corridor duty. This means that they are not assigned to a specific surgeon, but have the flexibility to jump in to reduce the workload of the nurses and nurse’s aides assigned to a specific surgeon as needed. The physiotherapists from the rehabilitation unit have daily duty at the outpatient ward between 10.30 and 12.30 am. This schedule
allows the physiotherapists to have face to face reports with the surgeons, nurses and nurses’ aides. It also allows them to give initial rehabilitation instructions to the patients at the outpatient unit and schedule them for their first appointment at the rehabilitation unit.

At the outpatient ward five teams sees 100 – 120 patients each day. Each team is scheduled to receive between fifteen and twenty patients, but overbooking is frequent. The clinic has on the average between 1200 and 1300 patients on their waiting list and on the average twenty new referrals per day. The ward receives patients that have been referred to the clinic by general practitioners or other health care practitioners outside the institution. These patients come to the clinic to consult with the hand surgeons on what treatments and operations might be needed for their condition. Secondly, the ward treats post-operative patients. These patients have been operated on at the clinic and have been discharged from the patient ward but are in need of post-operative care such as re-bandaging of their wounds, follow up on how the healing is progressing, and so forth. The third group of patients coming to the ward is acute patient cases. Acute patient cases include patients that have been in an accident and have been seen already at the orthopedic emergency ward, their local health center, or the regional hospital. These patients are referred from these initial treatment centers to the hand surgery clinic. Serious trauma cases coming acutely to the clinic are referred directly to either the patient ward or the operation theaters depending on the scope of the involved traumatic injury. Serious trauma cases are not referred directly to the outpatient ward to minimize the number of wards and staff dealing with these complicated patient. Acute patients are also post-operative patients that have recently been operated on at the hand surgery clinic, subsequently discharged from the clinic but have returned for acute assistance because their condition has unexpectedly worsened. The activity at the outpatient ward is thus a mixture of planned and acute visits. The staff constantly needs to reorganize and reprioritize their work in this setting.

Each patient has a primary-responsible physician assigned to him or her throughout the treatment course. At times, the assigned physician is needed for other duties, or is on leave, and thus, another staff physician steps in and takes over the management of the patient. An explicit policy from the hand surgery clinic is that a hand surgery patient is as much as possible treated only by the clinic. In other words the clinic wishes as much as possible to be able to manage the treatment and rehabilitation of the patient itself and minimize as much as possible that non-specialized clinics take over or become involved in the treatment. This is expressed at the clinic as “once a hand surgery patient always a hand surgery patient” (an oft-quoted phrase of the employees). In practice this is not always possible, especially
regarding patients living far away from the hand surgery clinic. These patients occasionally have to be treated by their local healthcare providers. To circumvent this problem as the clinic serves patients from the whole southern region of Sweden, many of them living far away, there is a specialized patient transportation bus called Linnea. For patients using this service, the schedule is tight. The significant time constraints imposed by the bus schedule makes it difficult for the patient to both have time for a visit at the outpatient ward and a therapy session at the rehabilitation unit before catching the bus which returns early in the afternoon. The significant constraints of this schedule can be quite stressful for both the patients and the staff.

### 2.2.4 Physical organization

The outpatient ward is located on the first floor and consists of six consultation rooms, three procedure/treatment rooms for performing smaller procedures as extracting pins. Each consultation room is about two and a half meters wide and six meters long. The windows have closed blinds and the doors to the consultation rooms are usually kept closed to allow for privacy. The core is centrally located where the medical records and the nurse bandaging sheets for incoming patients are collected at the beginning of the shift. The expedition also functions as the consult physician’s office. For the most part, the door to the expedition is open, but is closed
at times, for example, when the consult physician dictates into the Dictaphone. In addition, there is a plaster casting room, a reception desk, a waiting room, a conference room, a coffee room, and two offices respectively for the unit’s head nurse and the surgery schedule coordinator. An X-ray machine, which takes low quality X-rays, is placed in the corridor and the corridor becomes therefore occasionally a consultation room.

Between two consultation rooms, a small wall desk contains patient records assigned to the adjacent rooms. The six consultation rooms used by the staff hand surgeons contain an examination table, a small desk where most of the consultation takes place, an X-ray light box, a sink and a small cupboard. A computer screen is mounted on the wall over the desk and is mainly used for showing digital X-rays. The computer screen is positioned in such a way that both the surgeon and the patient can see the screen at the same time. The clinic has recently started to use digital X-rays, which they retrieve from an X-ray database. However since the clinic has only recently started using digital X-rays not all patients have digital X-rays. This is partly because their films were taken prior to the introduction of digital X-rays or because the patients’ X-rays had not been taken at the University hospital, but at another hospital or clinic without digital X-ray equipment. Thus the old X-ray light boxes are still used since some patients have non-digital X-rays in their patient records. The patient records are also partly digital and partly paper based. The doctors use Dictaphones; the cassettes are in turn given to the doctor secretaries that transcribe them into the patient journals that are then printed. The nurses on the other hand write their own nursing journal, which also is printed and put into the patient binder.

2.2.5 Scheduled and acute consultations

The outpatient ward is a mixture of elective and scheduled consultations and acute treatments. On average a scheduled consultation takes fifteen minutes. Half an hour is needed if the patient has a large bandage, is scheduled for a minor operation, needs to be plastered, or is in a need of a translator. Early mornings are generally speaking more calm because less demanding and time consuming re-visits are often scheduled to arrive at the clinic at this time. By eleven o’clock though, the tempo at the clinic will pick up quite a bit. The increase in tempo is partly because the patients arriving late into the morning usually need more extensive consultations. For example, some need to have large and complicated dressings rebandaged during their visit. Another reason for this increase in tempo is that acute patients
arriving at this time to the clinic cause an increase in the number of patients that need to be seen.

The typical sequence of work is as follows: a nurse or a nurse’s aide goes and gets the patient in the waiting room, shows the patient to the consultation room and brings the patient’s medical record from the wall desk into the room. Where needed, the nurses remove the bandages and clean the wounds and discusses with the patient how he or she has been doing. Finding the right level of engagement with the patient; that is not becoming too intimate and neither too detached demands considerable skill, and this takes time to acquire. Thereafter, the doctor arrives and the nurse leaves the consultation room to attend to the next patient who will be brought to the adjacent consultation room. When the patient’s consultation with the physician is finished, the nurse or nurse’s aide returns to finish up with final finishing touches, for example, bandaging the patient’s hand or arm. The surgeons and nurse’s or nurses’ aide’s work is therefore tightly connected and demands continuous coordination. Although the surgeons and nurses may work alone with the patients they frequently also work together in the consultation rooms.

Figure 11: A mixture of scheduled and acute consultations demands ongoing reorganization.

The work at the outpatient ward, being a mixture of planned visits and acute treatments, can cause the workload to rise to unexpectedly high levels and this requires radical restructuring of the staff’s usual routine to meet the demand thus imposed. During one of the observation periods, for example, we observed a particular shift of a surgeon-nurse team that had already been scheduled twenty-one patients which is more than the usual number of patients seen. However, the day before, late in the afternoon, the nurse had received a call from the mother of one the post-operative patients whose plaster splint had broken. The nurse had suggested that they should come early in the morning the next day. The nurse had coordinated for the patient to arrive early to be seen because she knew that the patient’s surgeon, who specializes in injuries to the brachial plexus, would be on duty that day, and because of the large amounts of patients that he would need to see, and because
these consultations would be time-consuming, it would be better for the patient to arrive before the complex patients with brachial plexus injuries should arrive in the late morning.

Although pre-planned from the day before, taking care of this patient became an extra task for both the nurse and the surgeon. For the nurse, it meant that she for an hour and a half was engaged in removing the patient’s plaster splint, cleaning and airing the arm, and making a complicated new plaster splint. During this time, she still had to check with the surgeon every ten minutes or so to take care of their regularly scheduled patients. Because of this sudden demand in time-consuming work, the student nurse who to some degree was able to help her out would give the nurse some assistance. This, however, was complicated by the other staff requiring the nurse’s assistance for other clinical issues. This all occurred while she herself had to go and fetch the surgeon taking care of this extra patient to consult with him on the making of the new plaster splint for the patient.

The reason that she was able to manage taking care of the extra patient was because the student nurse helped her out, because the surgeon she was working with took over some of her responsibilities, because the head nurse jumped in to assist the regular nurses and nurse’s aides, and because one of the patients, during the hour and a half she was taking care of this extra patient, needed a translator, and thus a double time slot was created allowing her to be away from her assigned surgeon for a longer period of time.

Fifteen minutes after finishing the fabrication of the complicated splint, the same nurse was again engaged in the care of an extra patient for about ten minutes. This was because a colleague had found it difficult to take blood tests on this patient. As such, the surgeons, nurses and nurse’s aides are often engaged in several simultaneously running tasks. Typically the nurse rushes between the two patients assigned to the consultation rooms her team is in charge of. However, frequently, the staff becomes engaged in the treatment of several other patients, making them rush between three or four different patients who need treatments concurrently. The reason for these fluctuations in workloads, for the ongoing need to reprioritize, and continuous reorganization of responsibilities, is because the outpatient ward is a mixture of scheduled consultations and acute consultations. The nurses and nurse’s aides pointed out that this mixture is highly demanding and stressful.

2.2.6 Early consultations

Besides following up on patients that have been operated on and treating acute patients, a big part of the outpatient ward’s work is assessing patients that have been
referred to the clinic. In many cases, the patient’s problems are straightforward and routine surgery and/or rehabilitation is needed. Frequently, however, whether or not a patient should undergo surgery and a lengthy rehabilitation is not clear-cut and the pros and cons of going through with the treatment need to be discussed at length with, and ultimately decided on by, the patient in consultation with the surgeons.

A common patient category referred to the clinic is patients with osteoarthritis, especially patients with osteoarthritis at the base of the thumb (the carpo-metacarpal joint of the thumb). These patients suffer from worn and thinned out cartilages between one or more joints in their fingers. Because the cartilages between joints lessen the friction between the bones, as osteoarthritis progresses, this cartilaginous cushion slowly disappears and ultimately causes the patients to suffer significant pain and even deformity. Consultations between the hand surgeons and patients with arthritis of the thumb base involve assessing whether the patients need and are willing to go through an operation and treatment for the disease or not.

Early consultations, although structured and defined by the surgeon who decides what should be discussed, are highly collaborative endeavors of meaning making. The surgeon shares his or her professional know-how when diagnosing and suggesting possible courses of treatment. At the same time, the surgeon is dependent on the patients’ knowledge of their physical and social circumstances. The first consultation typically consists of an inquiry into the patients’ daily life in relation to the ailment, a diagnosis of the condition, presenting possible treatment options and how they may affect the patients’ life in both the short and long run.

The consultation begins with assessing the patient’s general health condition and how badly the cartilages are worn and how it affects the patient’s daily life, type of activities and form of work. Patients are asked to provide anecdotes about how they carry and lift objects, if and how much the pain from the worn out cartilage affects their sleep and level of activity, etc. History is also taken on what prior treatments the patient might have had or tried. During this history-taking portion of the consultation, the patient is an important resource in the diagnosis. A history of the patient’s presenting illness is the road map on which the subsequent physical exam and diagnostic studies such as X-rays are based.

After the initial history, physical exam, and assessment, the surgeon explains to the patient what treatment and rehabilitation options are available and how they may affect the patient in the short and long run. The surgeon often begins by explaining that the prognosis after surgery is quite good and that most patients have close to the same mobility in their thumb. Furthermore, the pain disappears, but the thumb remains weak and becomes easily tired if used for more strenuous tasks.
Also, the patient is told that the surgery takes only an hour and that post-operative patients are typically enrolled at the clinic for a day and a half to two days. The surgery involves replacing the lost cartilage cushion at the carpo-metacarpal joint with tendon taken from the patient’s operated hand. This procedure also includes stabilizing the thumb by making a small hole at the base of the thumb and tying one of the tendons leading down to the thumb through the hole at the base of the thumb. Even though the procedure itself is relatively straightforward and short, the rehabilitation process is quite painful and long. The post-operative follow-up includes typically six months of rehabilitation with three months of sick leave. Even though the surgeons may inform the patients that the rehabilitation process is long and painful, their experience is that some patients after three months find the rehabilitation process too painful and in some cases regret having gone through with the operation.

The consultation typically ends with the surgeon either directly recommending surgery, requesting that additional tests be performed, or that the patient should try an alternative treatment before going through with surgery. However, even though the surgeon may suggest that a patient should choose surgery, it is important that the patient thoroughly think through and consider whether he or she is willing to undergo a procedure given its scope, association with significant post-operative pain, and lengthy rehabilitation. The collaborative reasoning and meaning making around what course of action should be followed is highly individualized, and depends on the patients’ physical condition, what stage the arthritis is at, how much pain it inflicts upon the patients, and what type of work and other daily activities the patients are engaged in. The decision to undergo the operation or not can be straightforward for some patients, and rather difficult for others even after a thorough consultation with the surgeon. The patients usually need time to consider what to do, and often want to discuss with relatives, friends, and if possible other patients who have gone through the treatment already, before deciding on a course of action. The first consultation is therefore in many cases open-ended.
The patients can receive quite a bit of information concerning their diagnosis and available treatments and their pros and cons during this consultation and because of the sheer volume of information, a lot of this can be difficult to remember after the consultation.

### 2.2.7 The patient as a resource

The staff at the hand surgery clinic is well aware that the patients are experts of their own ailment and how it affects their daily life. The patients are thus seen as important resources in the management of their diseases. The surgeon, as just described, is dependent upon the patient’s account of the history of the presenting illness. During the treatment process, the patients are also seen as valuable resources. For example, the nurse caring for the extra brachial plexus injury patient described earlier in this chapter asked the patient’s mother when making the new splint, “You who have seen this before, does it look right?” to make sure that part of the splint was positioned correctly and that it would not hurt the patient.

### 2.2.8 The rehabilitation unit

#### 2.2.9 Physical layout

The rehabilitation ward consists of three large open areas. The main and largest of these is the function training room, with a kitchen placed at one end of the room, the middle area with large tables, and a carpenter shop at the other end. The function training room is the heart of the rehabilitation ward. Next to the function training room is a training room containing several training simulation machines and a cooling room for patients who are overly sensitive to cold temperatures. The third large open area houses both occupational therapists and physiotherapist. The largest parts of the large open areas have walls that have glass windows from waist height to the ceiling, which makes these areas appear even more open. In addition, the rehabilitation ward consists of two smaller and more private physiotherapy rooms, the office of the social worker, a waiting room, a secretariat, and a coffee room. The openness of the physical organization is striking, especially when contrasted to the outpatient ward with its small private and closed consultation rooms.

One of the reasons for the large open spaces is to be able to arrange collaborative activities and social interaction between patients.

The rehabilitation ward at the same time, however, sometimes needs of more private rooms too. If privacy is needed, the physiotherapist’s rooms are used as
well as the social worker’s office. In some cases, training sessions are set in one of the physiotherapist rooms because they are calmer and easier for the patient to concentrate on the training. In other cases, such as meetings between the patients and the social worker, privacy is needed because difficult issues concerning the patients’ injury, how the injury is affecting and in some cases radically altering the patients’ private and professional lives, is broached.

2.2.10 Physiotherapeutic rehabilitation

At the rehabilitation unit, physiotherapists, occupational therapists, a social worker and a craftsman work, often in close collaboration, but also alone with patients in their respective rooms. The physiotherapists usually meet with their patients in one of their combined offices and treatments room. Most therapy sessions almost entirely take place around a small leather upholstered table about 30*60 cm wide. The physiotherapist sits on one side and the patient on the other with his or her hand on the table. Depending on whether the patient’s left or right hand is injured, they position themselves slightly differently in the room.

All rehabilitation sessions are preplanned and scheduled. However, being on time can be difficult for the physiotherapists because some patients need to be attended to longer than expected, because other patients arrive late to their appointment, and because still other patients have had an appointment at the outpatient ward which has been delayed. Patients that are delayed from the outpatient ward who need to take the patient transportation bus cause extra stress and demand sometimes ad hoc reorganization of the work to accommodate them.

In dialogue with the patients and by examining the patients, the physiotherapists typically begin by assessing the injury, explaining what type of surgery has been performed and what the chances are for recovering. Thereafter, the physiotherapists start instructing the patient. At this time, they adjust their instructions according to the patients’ individual physical condition, social circumstances, and personality traits. This patient coaching is framed around individual patient needs.
and worries and aims at motivating the patients to persevere in their therapeutic exercises.

In the following case example, the physiotherapist is meeting with a patient and is examining his finger and asking him how long it has been swollen. The physiotherapist palpates the finger gently and at this time the patient brings forward his concern that an area of the finger has a hardened lump.

Patient: There is something hard here, is it the bone?
Physiotherapist: You mean this? It is scar tissue that has become hard… everything is in layers when you are not injured. After injury and the bones are repaired and brought back together with the tendons and skin, healing doesn’t occur in these subtle discrete layers. Instead, the scar is like a lump. Some people get harder scars than others - it depend on genetics. Your scar will gradually soften; it will take about a year.

In this instance, the physiotherapist is examining the patient and inquiring into the swelling of the finger, which concerns him. The patient on the other hand has questions and worries concerning the hardening and thickening of an area of his finger. Although the hardened area is not something that concerns the physiotherapist, he is committed to taking the patient’s worries seriously, examining closely the hardened area and giving the patient a thorough explanation which eases his worries; thereafter they can return to their therapy session.

The physiotherapists continuously need to adjust their advice to accommodate to each patient’s personality traits. For example, some patients may be overly eager and ambitious in their recovery and efforts to get back to work and others are much too cautious and anxious about their recovery. Being overly eager in the rehabilitation can be just as problematic as being too cautious. Wanting to do too much too soon can sometimes cause a tendon to tear and set back the rehabilitation several months. In the following example, the patient is eager to return to work, which requires the
physiotherapist to caution him and find arguments to demonstrate to the patient why this is not feasible.

Patient: When do you think I can go to work?
Physiotherapist: What is your profession?
Patient: I’m a welder, but I will get a different job.
Physiotherapist: I can firmly say that your job as a welder will require that you not work for three months; if you were working in an office then you might be able to return to work even today.
Patient: But I could be a foreman and instructor.
Physiotherapist: Even so, you will need to grasp things in order to instruct.

When advising the patient, the physiotherapist takes into consideration the type of injury the patient has, how far into the rehabilitation he has progressed, and what type of situations the patient might face at work as a welder. The physiotherapist is able to convince the welder that even as a foreman, he will most likely be facing situations where he needs to actively use his injured hand, which would be counterproductive for his rehabilitation.

The physiotherapists have explained that their knowledge of the work of many different professions and what that means in relation to specific injuries help them formulate the type of arguments that they need to use to convince patients to stay within a prescribed course of treatment. This ability is acquired successively with time and experience and comes from the acquisition of a repertory of cases and experiences.

Giving training instructions to the patients is in many cases also highly individualized and specific to the patients needs. Injuries can be classified into categories but often, it is individual differences between patients within the same category of injury that affect the treatment in leads each patient into different therapeutic directions. The unit has written instructions on how to do certain exercises that each patient brings home. In some cases, it’s not possible to perform the exercise strictly according to these templates. For example, one of these brochures instructs patients to put their hand on a table and to slowly move the hand sideways. One patient that we observed said that he was unable to even put his hand on a table to get it straight. Thus, the physiotherapist showed him how to do the exercise in a different way where he instead puts his hand on his leg where it doesn’t have to be straight.
2.2.11 Facing the injury

To go through a treatment, even a smaller treatment such as straightening a crooked finger due to a poorly healed fracture ultimately requires that the patient be involved in a long and complicated rehabilitation process. An eleven-year-old girl, whom we followed through the whole treatment and rehabilitation process, needed nearly one year to recover from such an injury. Large traumas, such as de-gloving injuries or traumatic amputations of the fingers not only require emergency operations that can last as long as 24 hours to 48 hours, these patients often will need several subsequent re-operations. Such injuries often affect other parts of the body. Sometimes, the surgeons need to harvest blood vessels, muscles, bones, nerves, tendons, and skin from the legs, back or other areas of the body in order to reconstruct the mangled hand. Furthermore, these trauma patients a priori will face a long physical and psychological rehabilitation process. Part of the rehabilitation process might involve re-training the motor centers of the cerebral cortex to perform motions that it would have performed quite differently prior to the hand reconstruction. Even more, the life world of the injured patient is often completely turned upside down and these patients need close assistance with not only physical and psychological rehabilitation, but also help with readjusting to their daily life at home and at work.

Relearning the basics of life, such as how to dress and cook is something that patients involved in large trauma cases as well as those who have had smaller pre-planned elective treatments need to undertake. At the same time, these patients need to work out how the injuries and operations have affected their self-image and identity. The hand is an important part of a person’s identity and a fluent tool of communication. In this sense, an injury to the hand requires a patient’s to resolve and reconfigure their place in the world and how others will relate to them.

The child we described earlier in this chapter with a crooked ring finger resulting from a poorly healed fracture found her own finger “really disgusting.” When waiting to be enrolled into the patient ward the day before the surgery she would press the crooked finger between her pinky and middle finger to straighten it somewhat in order to envision how it might look like after the surgery. After her operation, when she was required to wear a splint, she wondered what her classmates would think. When instructed that she would need to do her therapeutic exercises at school, she stated that she would not be willing to do them during class periods when her classmates could see her remove the splint and perform the exercises. If she were to do them at school, she would do them during the breaks and alone in the classroom.

Similarly, the father of a teenage boy who had severely injured his hand while playing with explosives and firecrackers was concerned that his son did not use
the injured hand enough because he would hide it in his pockets. The teenage son, ashamed of the hand, risked worsening the rehabilitation of the hand by this inactivity.

These two examples clearly show us that an injury is much more than just a physical deformity but also has a significant psychological component that needs to be addressed. Patients often find it difficult early on in the treatment to look at their injured hand. However, in order for the rehabilitation process to be successful, it is important for the patients to be able to directly confront the reality of their hand injury. If they are unwilling to take ownership of their hand, it is difficult for them to start exercising the fingers or hand correctly. Delaying the exercises can be disadvantageous since with healing and formation of scar tissue, contractures can form and this can significantly negatively affect their ability to regain mobility.

A patient we observed who had had a severe axe injury that had almost completely severed his index finger almost fainted when being re-bandaged two weeks after his operation by a nurse and avoided at all cost looking at his injury. In difficult situations like this, the patients will need time, patient coaching from the staff, and encouragement in order to take the first steps in taking ownership of their injured body part. An effective way of engaging the patient into the recovery of their injured hand is through mediations such as X-ray prints.

The child that we followed who had had surgical repair of her crooked ring finger was the first week after the injury both highly interested in finding out how her finger looked like, but at the same time scared of looking at it. When waking up in the recovery room at the operation unit, the child explained that she was curious about how her finger looked like, but at the same time she was concerned that she would see the pins sticking out from the finger when the plaster cast would be removed. The next day, just prior to being discharged from the clinic, the surgeon asked her if she wanted to see an X-ray printout of her finger. She acquiesced. The surgeon showed her how the pin was positioned and how he had sawed away a piece of the ring finger bone in order to straighten it. The child having been given this information, stated that she missed her finger and that she would want to have a transparent plaster cast so she could see it.

A few days later, when visiting the outpatient ward for the first time after surgery in order to get a new plaster cast that would allow her to exercise her surgically corrected finger, this same patient again became apprehensive about looking at her finger. To honor this request, she had to lie on the examination table in one of the small operating theaters at the outpatient ward with her hand veiled by a curtain while the plaster cast was being removed. This did not stop her from being curious about how in actuality her finger looked. When the plaster cast has been removed,
but a bandage is still wrapped around the finger, the child quickly lifts the arm
above the curtain and looks at the finger and exclaims: “Uff!” Behind the curtain,
the nurse’s aide removes the bandage and the child’s father asks her if she wants to
take a look at it and she answers “no.” “It looks fine”, her father tells her and she
answers “I don’t dare,” but quickly thereafter looks again hastily at the finger say-
ing: “Ooop. Uhhht! Oh, there is a wound.” The nurse’s aide attempting to cheer-up
the child and prepare her to look at her finger says, “Next time you will look at it.”
First the child answers “No”, but than quickly changes her answer to “Maybe.”

The ambivalence and the wavering between wanting to see the finger and not
daring to look at it continued during her second consultation. When the surgeon
removed the plaster cast in the consultation room the child held her left arm before
her eyes, but looked twice through the cracks of the fingers at her healing finger.
The surgeon explained that they needed to go to the X-ray apparatus at the end of
the corridor and the child walked all the way to the apparatus covering her eyes
with her hand. Seated, she looked straight ahead at the X-ray display. The surgeon
took the X-ray the finger and reported that it looked fine. The child still seated said
that the X-ray of the finger looked better than the actual finger. Walking back she
glanced quickly at the finger.

For the child, becoming comfortable with looking at her finger after the surgery
took several weeks even though she was constantly curious about how her finger af-
after its correction. During the process of becoming comfortable with looking at her
finger which had a metal pin sticking out from it, the child could be confronted with
her finger through representations of it. While staying at the patient ward the day
after the operation and during the second consultation at the outpatient ward she
felt comfortable with seeing images of her X-rayed finger. In the first instance, even
though the surgeon in detail explained how he had reconstructed the finger, it was
through the radiographic image that the child came to a better understanding of her
condition. She was able to become fairly comfortable with her own finger when she
started getting training instructions from the physiotherapist. What her therapeutic
trajectory shows is that being able to look directly at the injury is far from straight-
forward and takes considerable time and successive adjustment. Furthermore, it
shows that the mediation of the injury, through X-rays, seems to create a distance
and reframing of the injury that is easier for the patient to emotionally handle. Also, this case narrative demonstrates that patients invest a lot of energy in learning to deal with their physically altered state. This can perhaps explain why patients in some instances are not fully receptive to what is said to them during a consultation and during training session. To patients, how their injury is perceived by relatives and friends is also important. They are concerned about their self-presentation in the perception of those around them. This to what degree they are willing to let others see and partake in their injury and rehabilitation.

2.2.12 Continuity in the patient treatment and rehabilitation

Patients experience the treatment and rehabilitation process often as unsettling. Part of the reason is that the need to deal with altered identities as well as practical issues of learning to perform everyday affairs with just one hand. They are confronted with an array of new and unfamiliar circumstance, including meeting unfamiliar individuals, activities and locations at the clinic. They do not know how the treatment process will affect their life in both the short and long term. The staff at the hand surgery clinic is well aware of this and has pointed out that the operation often can be technically successful, while the following treatment process can be a roller coaster ride through the different wards at the clinic where the patients often feel insecure when moving from one unit to another within the clinic, or moving from the hospital back home, or when meeting other local healthcare providers. Bridging and smoothing the transition from one place to another is seen by the staff as a central aspect of their work for establishing a sense of stability and security for the patient.

To minimize the unsettling and anxiety provoking experience of the treatment, the clinic works at creating continuity, bridging and smoothing the transitions between the wards, the clinic, and the home. Continuity is partly accomplished through assigning patients to a specific surgeon that follows the patient throughout the treatment. This means that the operating surgeon also sees the patient at the outpatient ward prior to the surgery, is in charge of the post-operative treatment at the ward, and meets with the patients at the outpatient ward after they have been discharged from the clinic. Furthermore, the physiotherapists often start the rehabilitation process by visiting the patient at the ward. Similarly, patients staying at the ward make visits as early as possible to the rehabilitation unit where they meet other patients and the rehabilitation staff. This change of milieu is uplifting and can minimize the patient’s fear of leaving the hospital. These early visits give the pa-
patients a glance into what life after the operation can be like and a first introduction to the patient community.

Similarly, the physiotherapists meet and often have the first rehabilitation session at the outpatient ward. This way, they can meet the patient together with the responsible surgeon and get an overview of the patient’s situation as well as guide the patient up to the rehabilitation unit after the joint evaluation and first rehabilitation session at the outpatient ward. During one such episode the surgeon began by giving an oral report to the physiotherapist stating that the patient had injured the middle phalanx after chopping it with an axe. The finger, the surgeon pointed out, was somewhat unstable due to the deep and large cut that was still open, but the fracture itself was however stable. The physiotherapists hearing this asked if the patient should start exercising the finger at which point the surgeon answered that he could start exercising the proximal interphalangeal (PIP) joint and distal interphalangeal (DIP) joint carefully. The physiotherapist then asked the surgeon if it was strong enough for that whereby the surgeon answered that it was as long as the patient did not use any force when doing the exercises. Thereafter, the surgeon left and the physiotherapist had his first rehabilitation session with the patient at the outpatient ward.

Currently, the transition from the patient ward to the outpatient ward from the perspective of the nurses and the nurse’s aides at the outpatient ward is problematic, especially when it comes to larger traumas. The nurses and nurse’s aides do not follow the patient through the different units as the surgeons do. The outpatient ward would like to be able to meet trauma patients before they are discharged from the ward in order to get a picture of the scale of the injury, how it is being handled, how the patient is coping, and to establish personal contact. The nurses and nurse’s aides can be displeased if they do not have a good picture of a patient’s condition, which in turn can distress the patient making him or her insecure. Even though the transition from the ward to the outpatient ward does not work optimally, the nurses’ and nurse’s aides’ awareness of this gap and their wish to bridge the gap between the units shows the importance of establishing smooth transitions to establish stability and minimize insecurity.

For many patients the transition from the clinic to the home is the most volatile and unsettling. At home, questions and worries facing the patients concerning their injury and what they can practically do are not as readily answered by themselves and the patients’ contact to the clinic is limited to telephone hours between nine and eleven am and one and three pm, except during Fridays when telephone hours are between nine and eleven am. The patients’ often worry and wonder about how much they may use or burden the finger. Mundane question such as if they can use
the finger to button shirts, wrench a dishrag and so forth become important issues that need to be confronted and answered. These seemingly mundane and simple problems can in many instances cause distress and insecurity. Even though the physicians, physiotherapists, and so forth may provide some answers, giving simple standardized answers to the patient can be difficult due to the differences in the patients’ social setting and due to character differences; some patients being overly careful, others patients being overly eager in their rehabilitation.

2.2.13 Picturing the forthcoming treatment

An important aspect of creating a sense of continuity in the patient treatment process is giving patients and their family a realistic picture of the forthcoming treatment. The staff is aware of how difficult it is to do this and to conjecture for them what their private and professional daily life may be like during and after the rehabilitation. This is particularly true of large traumas. Giving trauma patient a good picture of what can be expected in the early phases of their treatment is difficult. The patient is often in shock and not receptive or capable of thinking about the long-term consequences of the injury. According to the staff, this could be explained by the fact that the patients, being in a stressful situation, have a clouded perception and thus are only able to remember a small amount of what is communicated to them.

The child that we followed with the crooked ring finger was especially distressed about the surgery itself and how much it would hurt after the surgery. She was concerned with how it would affect her daily life as well as such immediate concerns as how the room she would be staying in looked like and whether her mother could stay with her. She had questions about how the operating theater looked like and what instruments would be used during surgery. When meeting with the surgeon at the outpatient ward just half an hour before being admitted into the patient ward the day before the surgery, the surgeon drew a large arrow on the arm pointing to the hand that was to be operated on. Even though he explained why he drew the arrow on the arm, the child an hour later wondered why he had drawn the arrow. During the consultation, she had been distressed and even though she seemed to catch what the surgeon had said, she was unable to remember the conversation. This goes to show that even patients going through simple elective procedures can have a difficult time concentrating and remembering what is being said to them.

It takes time for patients to orient themselves to the new situation and they seldom know what it is they need to ask the staff about to help them get a better
orientation of their new situation. The aim of the clinic is to inform the patients in advance so that they can mentally prepare for the coming treatments and rehabilitation. In doing so, it is important for the clinic to make clear what it can do and offer. The treatment works best, according to the staff, when the patient has realistic expectations of his or her treatment. Success stories of well functioning and recovered patients can be valuable for patients’ motivation. This does not mean, however, telling stories about patients that have fully recovered, but rather, stories about how past patients have subsequently led a good life with the ability to perform their activities of daily living despite the injury. It is also important to tell the patient about what they can expect the first days at home. Many patients call the outpatient ward about basic things that they are unsure of or distressed about.

For elective patients, who are usually more receptive, having a good picture of the coming treatment is important. The staff works at improving their communication with the patients about the coming course of events. For example, brochures were produced on the ten most common surgical operations and each of these explain shortly the typical symptoms of the affliction, how it is treated and what the patient can expect after the treatment. The patients’ meeting with the staff is, however, the most important way of teaching them about coming course of events. It is through dialogue that a more nuanced picture of the treatment can evolve when the staff knows more about the social circumstances of the patient and what type of personality the patient has. The staff is, however, generally speaking, careful with giving patients promises regarding the recovery. This is because they do not fully know beforehand how the treatment will progress and giving promises that cannot be fulfilled should be avoided. From the patients’ perspective, the perceived vagueness can at times be frustrating.

2.3.14 Summary

Central insight from the field study is first of all that treatment and rehabilitation at the outpatient ward and the rehabilitation ward consists of a collaborative articulation of the injury or ailment. What course of action is to be taken is a joint meaning making activity between patients and the healthcare professionals. The healthcare professional need to judge not only the physiological aspects of an injury but also the patients’ involved social circumstances and personality traits. Patients are asked to weigh and judge in relation to their ailment what course of treatment they are willing to take when presented with different treatment options.

Secondly, patients going through a treatment are distressed which makes it difficult for them to retain information and the instructions given to them. Part of the
reason for the patients being distressed is that they need to consider what the injury means to their identity, in relation to performing practical activities at home and at work in the short and long run, and because they are entering a new culture consisting of new persons, locales, and so forth, which to them is unknown. The staff is aware of this and aims to give the patient a clear idea of the forthcoming treatment process as well as attempt to minimize the distress caused by the patient’s need to move between clinics and return home.

Thirdly, even though the rehabilitation ward and the outpatient ward are part of the same clinic, and to a large degree treat the same patients, they are distinct practices that both socially and materially organize their activities differently. Common to both, the outpatient ward and the rehabilitation ward have very demanding patient care schedules. However, the patient treatment at the outpatient ward being a mixture of elective and acute treatments needs to, to a higher degree, reprioritize and reorganize their activities according to the amount of patient care that needs to be accomplished compared to the rehabilitation ward, which has a more predictable work load. Both wards conduct considerable amount of patient care activities around a fairly limited area. At the outpatient ward, this is at the consultation desk; at the rehabilitation ward this is around a small leather-upholstered table. The staff at both wards communicates extensively by using the patients and their own hands as models, but also uses other visual aides such as X-rays and poster illustrations of hands. The physical organizations of the two wards is however distinct; the outpatient ward consisting of small private consultation rooms while the rehabilitation ward consisting of a mixture of large open areas where patients can meet as well as more private treatment rooms.
In this chapter the aim is to locate the design explorations accounted for later within discourses that have emphasized meaning making as an ongoing socio-cultural endeavor lodged within specific communities of practices consisting of human and non-human elements.

The chapter begins by discussing various contemporary analytical perspectives on space and place put forth within human computer interaction (HCI) and interactions design. Perspectives that have critiqued the cognitive approaches prevalent within HCI and in their critique introduced notions of context, materiality, and the social, i.e., the social aspects of computing. These perspectives have to a large degree favored place over space, the local over the global, homogeneity over heterogeneity, and the social over the material. Differently phrased, these views tend to view meaning, coupling and contextualization as located completely in the social, arising in the immediate situation and as a deeply culturally rooted experience.

Even though these phenomenological accounts are highly valuable, setting up clear distinction between space and place, the material and lived experience, reifications and action, representation and practice, and tool and practice, they are problematic because they locate meaning making completely in the social. As such, most of the views see practice and physical elements such as the physical environment and artifacts as discrete and separate elements. Further, I find aspects of the analyti-
cal perspective problematic because of its emphasis on the immediate action and disreg­ard how the immediate activity or place of action is influenced by other actors or other places not currently present. Then, I criticize the notion of place put forth that emphasizes place as a deeply rooted homogenous and harmonious experience, because it ignores how place often is highly diversified and contested. Common to most of these accounts is that place stands for deeply rooted experience, while space is seen as devout of meaning.

Although I find many of these accounts highly valuable I suggest that it is unfruitful to draw distinction between space and place and between reifications and action. Further, since notion of place is often associated with deeply rooted homogenous authentic living I suggest that term space is more useful. Through using simply the term space I suggest the distinction between place and space, between that which is devout of meaning and full of meaning, between reification and action, can be overcome. Further speaking of space opens up for seeing activities and practices as spread across space and time, rather than located in the immediate local activity. Action and practice are thus defined by how they are connected in a network of relations rather than how they are circumscribed and how they are heterogeneous rather than homogenous.

I therefore go on to discuss perspectives that emphasize lived experience as relational and heterogeneous. The perspectives put forth are socio-cultural views of learning and Actor-network theory. I begin by discussing a socio-cultural view of learning and put forth the notion of communities of practice as a valuable way of locating meaning, coupling and contextualization. I in particular argue that the notion of communities of practice, which points at how learning and knowing or meaning and coupling is relationally defined and contested is useful. The notion of reification in participation is also presented as a viable way of going beyond viewing practice and tools as discrete elements. Thereafter I discuss Actor-network theory (ANT), which also points at how meaning, coupling and contextualization are relationally defined and spread across space and time. ANT is also put forth because it draws attention to how meaning is created through translation processes where different actors in a network of relations inscribe meaning into material form and through these translations processes stabilize rules and conventions. In conclusion I argue that designers need to acknowledge that meaning, coupling and contextualization happen across a network of relations, which is stretched across time and space.

Meaning making that will be argued for here, is thus neither located in the technology nor in the social, but in the interaction between humans and non-hum­an or in other words socio-material assemblages within communities of practice.
or relational spaces, which are diversified. This is in contrast to social constructivist accounts of technology and media, where meaning making is located only in the social where technology has no properties that affect human behavior and technological determinist accounts of technology and media were the technology and media have inherent qualities that determine human action.

### 3.1 Space and place within interaction design

The discussion on space and place within interaction design has been important to my research, because it has aimed at understanding the contextual aspects of computing. In doing so it has addressed such issues as how computation can be spread out rather than be concentrated to one place, how objects are given persistent meaning and by whom, how the coupling between various physical and digital objects and activities is managed and how they converge and what boundaries are set up between the physical and the digital. In short, the discussion as I see it, has focused on such issues as how meaning is given to physical and digital materials and how these relate to not only the social but also the physical environment. The discussion has therefore as I see it consistently aimed at understanding context not just as a social activity or practice, but as a social activity or practice which also consists of material properties, which need to be taken into account as well as being elements that can be exploited when designing for activities involving computation. And as the interaction designer Ciolfi notes, although the fields of computer supported cooperative work and interaction design in recent years have started to discuss the physical environment, “the physical context of interaction is a relatively neglected aspect of interaction” Ciolfi (2004, p.17). When given attention, I would like to add, it is typically seen as a frame for action as if the physical context was lying outside of the social; as a discrete element. The same I would say goes for artifacts, and other material elements.

I will now present a few analytical perspectives within HCI and interaction design and thereafter have a brief discussion that shows how notions of space and place are highly similar to phenomenological accounts, which privileges place over space.

#### 3.1.1 Analytical perspective on space and place

The notion of space, as Dourish (2001) describes, has been frequently used as a metaphor when designing systems for computer supported cooperative work. The notion of shared workspaces and virtual worlds are for example quite common
ways of thinking about and organizing these systems. One of the earliest instances within HCI and interactions where space and place is discussed is Ericsson’s text from (1993), which precisely suggests that we could use notions of space and place as useful metaphors for designing interfaces for collaborative systems. There he argued that physical features of space can be exploited when designing virtual worlds. He pointed out that people associate meaning to places and that certain objects are evocative and encourage interaction, but that we know little about why certain objects are more evocative than others. Evocative objects can catalyze direct interactions with the object itself, between people as well as indirectly where the evocative object functions as a medium. He further argues that space can constrain and generate activity. Stoplights both physically and socially constrain pedestrians from crossing the street, although these constrains are frequently overruled. Such constraints can in turn generate other activities such as buying newspapers from a news rack close by.

The notion of space and place was brought to a broad attention to the fields of human computer interaction and interaction design by Harrison and Dourish in their article *Re-Place-ing Space: The Roles of Place in Collaborative Systems and Space* (1996). In the article they argue that interaction design can learn from urban design and architecture when designing computer supported cooperative work systems. They point out that place for these domains is not seen as three-dimensional structure, but rather that place is established by how it is made distinct from other places as well as how it connects to other places. From this Harrison and Dourish argue that physical features that can be exploited are: relational orientation and reciprocity, proximity and action, partitioning, and presence and awareness. Harrison and Dourish draw a distinction between space and place were space connotes physical elements and place human experience or as they state “We are located in “space”, but we act in “place” (Harrison & Dourish 1996, p.69). At the same time they argue that designers cannot design place, but only for place. In other words designers can only create spaces or structures in computer programs, which then have to be transformed into places; made into meaningful spaces by the users. Meaning making is thus for them completely located in the social where the designer has no influence on the meaning making inscribed in the artifacts.

Dourish in *Where the action is – Foundations of embodied interactions* (2001) and in the article *What we talk about when we talk about context* (2004) expands this view considerably by joining the underlying ideas of tangible computing and social computing to form what he terms embodied interactions. Both of these projects, he points out, derive from the same theoretical foundation; namely that of phenomenology.
With social computing, Dourish, to a large degree builds on ethnomethodology, which through the work of Suchman (1987) among others helped move the field of HCI from focusing solely on cognitive aspects of computing to also focus on the social context of computing. In the 1980’s the dominating view of human action within computer science when describing user skills when formulating requirement specifications built on models that viewed human action as pre-formulated plans. The planning model supposed that human action is an execution of scripts and subscripts of action in order to achieve a preformulated goal. Suchman, however, convincingly argued that plans and actions are distinct items that never fully correlate. In fact the planning model completely misrepresents human action.

Instead Suchman suggested that human action is deeply situated or contingent upon the social setting and organized around that setting. Further human action is what creates the setting. In other words the context of human action is not stable and predefined as the planning model assumes, but rather a social dynamic process that is continuously being created and redefined. We organize our actions by responding to arising features of the setting which means that situated action is essentially an improvised activity demanding ad-hoc adjustments, inventions and approximations. Human action does not simply follow scripts for actions, but rather demands active participants that shape the specific circumstances facing them. In doing so, humans develop commonsensical, mutual intelligible and accountable methods for organizing everyday behavior.

Suchman’s, amongst others, focus on practice, as Dourish (2001) describes, moved the field away from viewing work as regularized and formalized procedures often presented as models and abstract accounts towards real activities and experience. The ethnographic approach pointed out the need for HCI to design computer systems that build on the work practitioners’ view of their work. For members of a practice, work consists of informal albeit routine ways of handling day-to-day contingencies, rather than predefined processes.

By demonstrating how human action and reasoning is deeply situated or in other words emergent and interactional, Suchman showed how misguided or difficult it is to make machines have an ‘conversational’ form of interaction, since conversation is a highly situated interactional activity where the meaning of the conversation emerges as people talk, repair misunderstandings, and so forth. But by doing so and emphasizing interaction as purely conversational she located agency purely in the social and in particular in immediate conversational interactions; a stand point she has revised and I will return to.

The architect Lainer and researcher into computer supported cooperative work Wagner (1998) have sought to find ways to design both physical and digital spaces
and places that can engender particular social activities. In their work they draw on research from computer supported cooperative work on the social use of space, which have pointed out the importance of establishing defined zones, establishing connections between zones, the open-endedness of use and events, and awareness of ongoing work. Drawing on these findings they argue that it is possible to create bounded zones that are dedicated to a specific activity; transformation layers that connect for example the inside and outside; and spaces which define how places connect to other places. Further they argue that physical place can be more or less encoded; intermediate space being open to be defined rather than heavily coded. More recently the architect McCullough has argued that physical structures or architectural types can shape cognition and expectations; where structures create stability and persistence, which allows for the flow of human activity (McCullough 2004).

Along similar line De Michelis et al (2000) argue that different physical organizations, technical and organizational set-up affect collaboration and communication in different ways. They describe how in the first manifestation the Domus Academy and the DARC research centre were physically adjacent and consisted of open expanses of space where the walls were covered with illustrations. Also, the technical set-up consisted of a hot desk used during certain phases in the design process. These physical and material preconditions engendered communication between students and researchers as well as informed designers having been away. In the second set-up of the Domus Academy and DARC the layout, dividing the two institutions, significantly influenced the communication between the students and researchers. The two institutions not being adjacent to each other resulted in the researchers not passing through the educational facilities and neither did the students visit DARC since they would have to pass through the administrative area. Further, the spaces are no longer organized around projects, but around individually assigned roles. Collaborative project activities being in this constellation designated to conference rooms. The technological set-up has also changed, where the designers now have their own personal computer, which has become their main design tool. In this way the new spatial organization does not support communications and cooperation between students and researchers, has made cooperation within project teams more cumbersome and made the presence of the design projects less visible. Pointing at how social, technical and physical organization is tightly intertwined.

Brown and Perry (2002) suggest that we adopt how current cultural geography use the terms where space refers to “abstract processes that organise and arrange the material world” and place to the “everyday physical world and the activities go-
ing on” (Brown & Perry 2002, p. 249). Here space is not simply the physical world, but rather how different places are connected to each other through global transactions; or the flows of material, people and money. Thinking of space and place along these lines the authors argue will help us articulate the tension between the local and the global, the situated aspect of embodied action and its distributed more abstract counterpoint, which technological design projects will most often be confronted with. Research into the design of technology has tended to “over-emphasise place over space – the local over the generic” and thereby not acknowledging how, referring to Latour, action at a distance is made possible through immutable mobiles.

Geraldine Fitzpatrick (2003) has developed what she calls the locales framework to support designers developing computer supported collaborative work applications and consists of five aspects: locale foundations, individual views, interaction trajectories, mutuality and civic structure. **Locale foundations** refer not necessarily to a physical location but a conceptual place. This conceptual place centers on a shared activities and the resources used, which can be distributed across the country or even nations where different local actors work over a distance. **The individual view** brings the individual aspects into focus as well as how people dynamically and seamlessly shift between different locales. **Civic structure** on the other hand focuses on how the individuals engaged in a shared activity are connected to the wider community, where such issues as organizational, professional, financial, political and legislative issues can be focused on. **Interaction trajectories** points to the relevance of studying temporal aspects, such as the past, present and future of the shared activity as well as the workflows, phasing, articulation and management of the groups’ interactions. **Mutuality** relates how a shared place within a locale is achieved through presence and awareness.

Crabtree sees space and place as interactional and “interwoven both with and in conduct.” He points out that spaces and places are mainly organized so as to be able to perform certain activities. As he states: “Seen from the point of view of interaction in everyday life, spaces and places consist of intelligible or meaningful material arrangements which are tied to the performance of particular activities. Without such arrangements, activities could not be accomplished” (Crabtree 2000).

More recently Ciolfi (2004) designing a hybrid exhibition environment makes the case that humanistic geography has the most developed and most viable conceptual framework to offer interaction designers, which puts emphasizes on how people experience, interpret and find various locales meaningful. Common to these theoretical notions is that place is created out of the interaction between structure and human activity. Places contain structural, cultural, and social clues that con-
strain and enable behaviour. On the other hand, our interactions with the place adds (new) meaning and value to the place. Ciolfi finds Tuan’s experiential perspective particularly useful and his categorization of place as consisting of four distinct, but interrelated dimensions, which do not exist a priori. These dimension being: physical or structural which is sensed and explored; personal, which is evocative, has to do with one’s background, and one’s investments in a place; social dimension, which has to do with the interaction, co-ordination, ethics and resources; cultural dimension, which has to do with rules, conventions and identity.

3.1.2 Discussion

The debate within HCI and Interaction design has been valuable for my research since it has aimed at understanding how physical and digital materials can be mixed and be given persistent meaning. It has also been valuable for my research because it has aimed at taking the material aspects of human activities seriously and in particular how the insertion of new material relate to not only the social, but also the physical environment. However, in relation to my own research I have found aspects of certain of these analytical views problematic and delimiting. First, I find it problematic to view space and place, or differently termed reifications and practice, as two discrete categories. Second, some views tend to locate meaning, coupling and contextualization in the immediate and locale circumstances and ignoring how the local and the immediate are influenced by other times and actors not present in the immediate situation. Third, very few of these perspective argue for seeing place as highly diversified and contested, but instead stress the ordinary and the homogenous.

Central to the discussion concerning space and place within interactions design has been whether or not or to what extent physical structure such as three dimensional expanses of space and physical artifacts can enable and constrain behavior and further how such physical features can be exploited when designing virtual worlds or other kinds of collaborative software. This discussion has to a large extent centered on to what extent meaning can be inscribed into physical elements if at all and who gives them meaning or contextualizes them.

On one hand, Harrison and Dourish, Suchman, Fitzpatrick, and Ciolfi locate experience and meaning within human agency and the social. Therefore both Harrison and Dourish and Ciolfi explicitly argue that designers can only design for place. On the other hand Lainer & Wagner (1998), Erickson (1993), De Michelis and McCullough see space as a substrate for human interaction, which engenders social activities and behavior. These authors, as Ciolfi (2004) points out referring
specifically to Lainer & Wagner and Erickson, assume that certain activities can be prompted by the designed physical and digital spaces. However, even though Ciolfi acknowledges “that the physical environments contribute to shape our experience and activities in some way,” she does not think that the relationship between structure and experience is as tightly connected as these authors suggest (Ciolfi 2004, p. 33). Discussing Lainer and Wagner (1998) and Ericksson (1993) she states that:

...experiences within spaces go well beyond such a straightforward relationship between structure and action. In fact, I have mentioned how we become attached to certain environments, how they convey meaning to us. All the dimensions that characterizes people’s relationship with space are very much those of their experience of it (Ciolfi 2004, p 35).

I agree with Ciolfi that there is no simple relation between physical structure and action. In fact, Lainer and Wagner (1998) do not present any empirical observations to support their claims and Ericksson (1993) simply states that physical structures and objects are evocative without being able to state how. And I also agree with Munro (2000) that the same physical structures mean different things for different people and can be used for different purposes. However, De Michelis et al (2000) show with their study of the Domus Academy and the DARC research centre how two different physical organizations, technical and organizational set-up affect collaboration and communication in different ways. Although their study seems to suggest that there is a to some degree direct relations between physical organization of spaces and the material set-up it is difficult to weigh the importance of the different elements and how they affect the experience of studying and working at the Domus Academy and the DARC research centre.

Further, in relation to my own work the study at the hand surgery clinic pointed out also that the physical environment plays an important role in regard to how the work is organized. The meeting between the healthcare professionals and patients happen for example typically at specific locations within the wards such as around the consultation tables. Although the consultations at the rehabilitation ward and the outpatient ward are both physically located to a large extent around consultation tables, these spaces are quite different. Visits at the outpatient ward happen within small private and closed rooms. Visits at the outpatient ward typically happen within open collaborative spaces and mostly during a later phase in the treatment were the issue of privacy is not as important and where often the staff knows more about the probable outcome of the treatment.
The study also showed how the treatment, although mainly carried out within a clinic, is stretched across several sites, compartmentalized, and to some degree fragmented. The patient treatment is in other word spatially distributed between the different wards at the clinic and the home. The transitions between these sites are to some degree perceived by the patients to be demanding; especially the transition from the clinic to the home. The healthcare professionals are well aware of this and try to minimize the sense of insecurity associated with compartmentalizing the treatment. The physiotherapists for example visit both the patient ward and the outpatient ward to smooth and bridge the patients move from one ward to another. Since part of the treatment is carried out at home by the patients themselves the physiotherapists also give patients leaflets describing the exercises they need to do. The hand surgery clinic is thus, as so many contemporary forms of healthcare treatments, spread out. This spreading out or spacing out demands in turn that the staff need to develop ways of creating persistence between the sites; both for themselves and for the patients. That the treatment process in other words materializes in such a way plays an activate part in shaping how the treatment is carried out.

The field study at the intensive care unit pointed out how the staff at the intensive care unit associated learning and knowing to different locations. The coffee room was seen as a place for sustaining tradition and discussing and reflecting upon changes in their practice posted in the Daily information folder. The patients’ rooms on the other hand were seen as central locations for sharing, gaining and developing knowing through collaboration where the situation at hand was used as a resource for highlighting what needed to be shed light on. Different locations given different meanings and values pointing at that the unit is not one homogenous space, but rather consists of a range of diverse spaces.

It also showed that handling medical technical equipment means knowing how the equipment not only relates to the treatment of the patients, but also to the physical circumstances at the unit and at other clinics visited. Handling medical technical equipment, which the unit was crowded with, in other words meant adjusting highly standardized global products to the local circumstances. In some cases knowing how these global standardized products relate to more locally built standards such as the size of the patient rooms, the size of doors and available wall sockets, local ways of treating the patients, as well as to other global medical equipments. The work of adjusting these global, standardized and stabilized products was partly done by making locally tailored short instructions as well as posting fleeting messages on the equipment or next to it in the physical environment surrounding the patient being treated. These instructions and postings needed in turn to be interpreted and adjusted to the situation at hand. The physical environment
therefore can be said to be highly intertwined part of working at the unit. It is not just question of how the staff experiences the physical environment; rather the physical environment enables and constrains certain forms of activities.

Drawing a distinction between space and place as Dourish, Fitzpatrick, and Ciolfi do and thus locating meaning, coupling and contextualization in the social is in my opinion problematic. To define space as the physical and the mechanical elements of the world that are devoid of meaning, as Dourish does, is problematic since we can never bracket our cultural understanding of the world. It is in other words impossible to talk about space without some kind of meaning being attached to it. To think of space in these terms is in fact highly cultural. And as Brown and Perry state: “searching for where meaning stops and the physical world starts is futile” (Brown and Perry 2002, p 247).

Setting up a clear distinction between space and place, the material and lived experience, reifications and action, representation and practice, and tool and practice, as the cultural geographer Massey (2004) shows, has a long standing tradition within western thought. She points out how both the philosopher Bergson (1911) and the anthropologist deCerteau (1984) for example find representations, which they see as spatialisations, as fixating life. Similarly the philosopher on place Casey (1997) sees space, which he terms site, as denoting abstract and stratified properties, while he sees place as filled with human investment and meaning. To him place is lived space, just as Dourish argues, and foundational for human meaning. Throughout history, however he states, space has been seen as foundational and place in turn has been subordinated to space. This has been unfortunate since space or “site is the very undoing of place, its dismantling into punctiform position” (Casey 1997, p. 186). Although I find Casey’s erudite study of place highly valuable setting up a distinction and clearly separating space and place is problematic. And as the artist and researcher on space and place Sandin (2003) argues, if we view space as devout of place-value, as Casey argues that different mappings are, we miss seeing how these practices of mapping; of seeing something as space is rich in existential and emotional value. These practices of mapping in other words can be richly situated practices. Further, Sandin (2003) argues that mapping, a typical practice for cartographers, architects and urban planers, are potentially sound and liberating tools. The engagement with different forms of mappings cannot be seen as automatically constituting a detached attitude to place. The practice of reading or creating mappings of places can in fact be filled with emotional attachment to the places that the mappings refer to. Further, Sandin points out, that viewing practices of mapping as violations and attacks upon placial qualities and place as vested with genuine lived action “risks diminishing the importance of other mechanisms
in violating action that could belong to “place” just as much as to a “site” ” (Sandin 2003, p. 27). In other words place is not always just authentic, thoughtful, peaceful, homely, but can also be filled with conflicts. Massey (2004) suggests therefore that we should not view space and practice, representation and practice, and so forth as discrete separate elements, but rather as highly intertwined. Reifying or making representation, often associated to the notion of space, should not be seen as an activity of fixating, but rather becoming; as:

“…an element in a continuous production. This is a position which rejects a strict separation between world and text and which understands scientific activity as being just that – an activity, a practice, an embedded engagement in the world of which it is a part. Not representation but experimentation. It is an argument which has been made by many (for instance Ingold, 1993; Thrift, 1996) across a range of disciplines” (Massey 2004, p. 28).

In other words what Massey (2004) and Sandin (2003) and I also adhere to is that it is unfruitful to view space and place or representation and practice as distinct separate categories. Place always materializes and is therefore a practiced space consisting of human and non-human elements.

The point being made here is not to degrade lived experience, situated action or practice, rather to argue that lived experience and practices are always spatial. They materialize somewhere, are located somewhere, arrange their physical world somehow, and consist of physical elements, of representations, of artifacts and so forth. There is no activity that is not spatial in one way or another, where the spatial elements can be disregarded. The hand surgery clinic for example has arranged its practices in particular way where activities and objects are spread out in specific ways across space and time both on a large scale and on a small scale, which both patients and healthcare professionals need to constantly deal with. There are no activities that happen within meaningless physical environment. Regarding artifacts or representation it is likewise counterproductive to see them as discrete elements, which have internal properties. Instead the qualities of the artifacts and representations are relationally defined and receive their meaning in relation to the practice. As such the self-produced rich media documents that the healthcare practitioners and patients have made as part of the research projects are not discrete elements, but receive their meaning or their distinct rationality precisely from how they have evolved in relation to the practices. Drawing a distinction between space and place and between artifacts and practice in such a way is therefore deeply problematic
and unfruitful since it does not draw attention to how the physical environment or formal tools are intertwined with particular practices.

The second difficulty I have with the perspectives within HCI and interaction design on space and place is that they to a very little degree account for how place or lived meaningful experience connects to other times and other places and how meaning is made persistent and stables. Fitzpatrick (2003) and Brown & Perry (2002), I acknowledge, point out that places or locales connect to other places and other times. However, Brown & Perry ways of distinguishing between place and space and between the local and the generic is unfortunate. First of all, I do not agree with them that space should be associated with what they call “abstract processes that organise and arrange the material world” (Brown & Perry 2002, p.249), which to them means how various places are connected to each other through the flow of materials, people and money. Defining such connections or networks as abstract and in opposition to local situated activities does not acknowledge that such global processes are highly concrete, material and situated. Secondly, I find it problematic that Brown and Perry view generic technologies as abstract and discrete elements, which they equate with the notion of immutable mobiles; a term they borrow from Actor-network theory (ANT), which I will attend to more fully later in this chapter. Immutable mobiles, according to ANT, are inscriptions in the form of representations, which stay stable as they travel through space and time. The notion of immutable mobiles, as I understand it, does not connote generic and abstract elements that can be transported across vast distances in some abstract un-situated networks. Rather immutable mobiles can travel across space and time, because they are networked in a meaningful and complex way across heterogeneous networks of relations, which have been established out of hard work and a series of negotiations. I therefore find it highly problematic to view immutable mobiles as abstract and discrete elements and distinct from situated practices locally bound. Both local and global networks create and use immutable mobiles. Both local and global networks in turn need to “defrost” such reifications as immutable mobiles can be said to be. This does not mean that I equate local practices with globally spread out practices. The point being made is that I find it difficult to imagine an abstract network. If I can recognize that a network exists, whether on a local or on a global basis, it is not abstract, but highly concrete and full of meaning. The interesting issues to address is not whether the global or “generic” technological components are abstract, but rather how they get their meaning in relation to other actors in the network to whom they are meaningful.

Although I find Brown & Perry’s distinctions somewhat problematic I agree with them that we should not only focus on how technology becomes “defrosted,”
but also how it is made persistent and can be made to travel. Delimiting place, meaning making, coupling and contextualization, as Dourish does, to the immediate misses how the immediate situation is influenced by the past and other actors not immediately present. How for example technologies made at a distance influence the work activities within a particular local practice. Dourish notion of place, drawing upon ethnomethodology, is as Chalmers (2004) points out largely a historical. This is because the ethnomethodologists, who focus on moment-by-moment interactions, marginalize history and memory. Chalmers, referring to Giddens (1995), states that ethnomethodology has several qualities and has been highly valuable for pointing out for example that language is not a series of signs, but a medium for practical communication; that humans are reflective active agents; and that action and arises out of the situation. However, the weaknesses of ethnomethodology, according to Giddens, is “who creates meaning, manages coupling and contextualization” (Chalmers 2004) tends to underestimate or ignore those not present in the current situation. As such, ethnomethodology focuses on how society is produced through accountable and intelligible interaction, but not as much with how society is reproduced through a series of structures. This does not mean that such structures determine the actions of a person, but rather that they influence the activities encountered.

The studies and design experiments at both the intensive care unit and the hand surgery clinic have been highly influenced by ethnomethodology, which has pointed out that context of action is a relational property, dynamically defined, and arises from the activity. However, it is a relational property, which is not only defined by only the immediate circumstance – (although these are highly central), but also to prior circumstance and other spaces. And although I agree that context is dynamic and arises from the activity and cannot be defined in advance, the place of action is neither undefined nor blank. The immediate encounters are in many ways open-ended and as we engage in them make our own history, but these encounters are not only chosen or defined by ourselves. They are made under circumstances that have been defined over time. Social life is “both space-forming and space contingent, a producer, and a product of spatiality,” as the political geographer Soja (1989, p. 129) argues.

Thirdly, the analytical perspectives put forth within HCI and interaction design, although highly valuable, do not account for how places, or as I prefer spaces, can be highly differentiated and contested. Munro (2000) being the exception who simply states that a place can mean different things to different people. Accordingly, I find the notion of place as put forth by Tuan in particular problematic, which Ciolfi thinks is the most viable perspective for interaction designers to adopt.
It is problematic because Tuan’s perspective, although emphasizing human experience over quantitative, objective, and so called spatial, accounts of places typical within his discipline at the time, emphasizes place as having essential and even universal qualities. For Tuan, place stands for security and stability, while space is open and free and potentially threatening. Accordingly, Tuan tends to equate place with authentic living, where authentic living is defined as deeply rooted, contemplative, and harmonious. This view, as Cresswell (2004) states, is closely connected to the idea of homeliness in the work of Tuan, which builds on Heidegger’s (1996) notion of dwelling and Bachelard’s (1994) analysis in Poetics of Space where Bachelard argues that the home is our primary place reference defining how we experience other places. Consequently, to Tuan a sense of belonging, that is a sense of attachment and rootedness, happens when the living on the earth is transformed into homeliness. The home, as Cresswell (2004) argues, is however for many not associated with homeliness and a sense of belonging. He points out how feminist geographers such as Rose (1993) make the case that the home for many women is a place of power battles, disciplining and even abuse. What Rose critiques such humanist geographers as Tuan is their focus on place as having essential and even universal qualities, while the experience of place is highly differentiated. As such, Tuan although arguing for studying lived experience, without a pre-theoretical and a priori categorizations or value systems, tends to have an a priori value system when defining authentic lived experience. This as Sandin (2003) points out is typical for phenomenological views of place, which have a pre-defined value system where for example temporal places are typically seen as being inauthentic. The same could be said about the discourse within interaction design.

Common to most of the views presented is that they have emphasized lived experience and agency as belonging solely to humans, as being locally bound and homogenous, and that meaning only arises in the immediate situation. In regards to the issue of agency and materiality phenomenological accounts view to a large degree space, physical or mechanical elements, and representation as distinct from humans as such as lying outside the social collective. Although these authors have had good reasons for opposing many forms of reifications, they have to some degree ignored in what way reifications in the form of documents and technological artifacts can function as valuable resources. The analytical perspective put forth have also tended to focus on the immediate situated aspects of human activities. Although I agree that this choice of focus is valuable, it tends to ignore and underestimate how the immediate is given meaning by other actors not present in the immediate situation. Last, I have also pointed out that these accounts to a very little
degree focus on how space or as most of the authors word prefer place is highly heterogeneous and contested.

### 3.2 Learning, knowing, and communities of practice

So far I have pointed out how discussions within interaction design on space and place tends to see practice, activity and agency and physical elements as discrete elements. I will now turn to notions of learning and knowing as put forth by a socio-cultural view of learning. The reason for this is that it foregrounds the context of learning, rather than viewing it as a mere container or backdrop. As Säljö (2000) states within a socio-cultural view of learning “there is not first context and then activity, rather the activity or actions is part of, creates and recreates the context.” Although we can analytically talk about different types of contexts; the physical context, a cognitive or mental context, communicative context, and a historical context all social situations are combinations of these elements. As such the context is not separable from what you learn; rather it is what is learned. In relation to this I will in particular discuss the notion of communities of practice as a valuable analytical framing work for pointing at how meaning making is negotiated and how work practices can be seen as consisting of heterogeneous formal and informal groups. Secondly, because a socio-cultural view of learning emphasizes that tools and practice, just as the context and practice, are highly intertwined and historically contingent. As Lave argues cognition in everyday practice is “…distributed – stretched over, not divided among – mind, body, activity and culturally organized settings (which include other actors)” (Lave 1988, p. 1) In doing so I will in particular focus on the notion of reification and participation as a fruitful way of overcoming the dualism of agency and reifications and the notion of communities of practice within communities of practice, which emphasis meaning, coupling and contextualization as relation and heterogeneous.

#### 3.2.1 Social framing and reflective practice

Within a socio-cultural view of learning, what it means to be knowledgeable subjects, both as individuals engaged in everyday mundane activities or as professional practitioners within a practice foregrounds the importance of competent judgment and how we use competent judgment to identify what the social situation is, which in turn is used as a structuring resource. The emerging situation in other words helps us continually redefine what the goals pursued should be as well as what rules should be actualized.
Most of the time, both as individuals and as professional practitioners, the situations facing us are more or less familiar. This means that we can recognize and competently act within the shifting social framings that we participate in without needing to clearly articulate what the situation is. The notion of social framing, which comes from the sociologist Goffman (1996/1974) are interpretive schemas that help us to understand and interpret the situations we are part of. The social framing informs us and guides us about what is expected and legitimate in a certain situation. Most situations have established some kind of routines and we know what reasonable reactions are. As such the social framing is normative in the sense that it helps us determine what is acceptable and unacceptable behavior as well as what is a reasonable interpretation.

But even though social situations have certain continuity and routines that frame human action, they are still open-ended. Human action as Säljö (2000) states is defined both by continuity and variation. What characterizes social situations and human action is the deployment of competent judgment in interpreting the situation, how it should be defined, and what type of knowing and action is needed to competently act. In other words, even though a situation has a social framing of expectations and routines, these need to be identified, recognized and reconstructed. It is not a matter of following rules, (even in routine situations), rather it is choosing what rules and routines should be used and what artifacts are most suitably applied in the situation.

This is in line with how Schön (1987) has described how a central competence for professional practitioners is precisely identifying the problem at hand, which is often not a clearly defined problem domain, but rather is indeterminate, messy and full of conflicting values and perspectives. To make the indeterminate situation manageable the practitioner finds strategies for defining the problem through what Schön calls naming and framing the situation, (which is mainly done through reflection on action). Through framing and naming, which are externalizations for example in the form of drawings or conversations, the practitioner focuses on particular parts of the problem with the purpose of testing where to direct his or her acting. Central to naming and framing is improvisation, because the problem cannot be examined with technical rationality where the best technical solution is chosen for a specific purpose or where techniques and theories are easily applied to a situation, rather what is required is a less formal or nonrigorous approach.

Within sociocultural view of learning which foregrounds context or points out the importance of the social framing thus points out first of all how the social framing functions as a structuring resource, which shapes or helps us define the nature of the task. Secondly, that it demands competent judgment or reflection upon how
the context should be defined, what the problem at hand is and how it should be approached.

The meeting between healthcare professionals and patients for example happens within a social framing which both recognize and acknowledge by taking on their respective roles. When the doctor asks the patient “how are you doing?” or “what is troubling you?” this obviously means something else than when a friend asks the same question and the patient recognizes this and answers accordingly. Both parties are also fully aware of the time constraints that frame the situation. Further both acknowledge that the relationship between them is asymmetrical; that the doctor, nurse or physiotherapist sets to a large degree the agenda by being the one who asks questions and by focusing on certain aspects and ignoring others or as Schön (1987) would call it naming and framing the situation. Both acknowledge also that it is legitimate for the patient to take on the role of being in need of help and being taken care of, although this can at times feel threatening to the patient, as the physiotherapist researcher Thornquist (2001) shows. That the healthcare professionals due to their superior position should define the degree of intimacy is also an unwritten communicative agreement which both parties most of the time accept and follow. Both parties acknowledge also that the patients concerns are in most cases a highly private affair.

Although what roles the different parties take is defined by the social framing it does not mean that they are predefined and static, but rather shift depending upon the changing social circumstances. What is communicated about and how it is communicated is adjusted to what happens when meeting as well as what has happened during prior communicative activities; in other words how the different partners synchronize their immediate and prior communicative acts. When carrying on a conversation, as Thornquist (2001) points out, we focus on each other, rather than just on the content that is being put forth. The relationship to the other partner decides what we talk about and how we speak. Here as she points out a central ability is to assume the others perspective; that is, try to understand why and for what reason the ones we are communicating with say what they say in a specific manner. Communicating in other words is not just a matter of content, but also includes a relational aspect, i.e., how an individual sees himself in relations to others and how he or she wants to appear to others, which is seldom articulated or made explicit.

Similarly how the asymmetrical relationship is managed is not given in advance. In the hands of healthcare professionals power can be abused, but can also consist of mutual respect where the different competences that both parties have is acknowledged. Being in a position of power means, however, having greater responsibility since that position entails greater control of the social framing and to what
degree the healthcare professional should become involved with the concerns of the patient. The roles that the two parties take affect what possibilities for collaboration are opened up for. It is therefore important to ask who has power and how it is used, how different parties negotiate how the situation should be defined and what roles they should be given, how the formal and informal rules are used, and who is made peripheral?

3.2.2 Communities of practice

Although the notion of social framing has been highly useful when analyzing specific situations, both during the field studies and the design experiments, focusing on the immediate situation does not account for how work practices organize everyday activities so that members are able to competently act and learn from each other. The descriptions of both the intensive care unit and the hand surgery clinic have shown that the way they organize their practice plays an important role of distributing responsibilities and engendering the sharing of experiences. I pointed out for example how the intensive care unit distributed responsibilities between formal and informal competence groups. I also described how different groups grow out of day-to-day concerns of the unit and start to become engaged in developing new ways of working; for example new ways of healing wounds. I also explained how some competence areas are quite informal and at times not officially acknowledged such as transporting patients. The study of the hand surgery clinic also pointed out that the way of organizing their work is highly related to how the staff can competently act. At one level I argued that the hand surgery clinic can be seen as one unified work practice working towards the same goal. The different wards to some degree can be seen to be distinct practices. Further each ward in turn consists of various groups of people that are experts in their respective areas. At the outpatient ward a few nurses and nurses’ aides were for example plaster cast experts who were also engaged in training other nurses and nurses’ aides. The units therefore at one level can be seen as a homogenous practice working towards the same goal, but at another level it can be seen as consisting of heterogeneous groups that have different experiences and know-how. The unit consist in other words of various groups and individuals that belong more or less intensely to different areas of expertise and knowledge domains, which intersect and overlap. During the design experiments, accounted for later, it also became quite clear how the staff at both clinics were engaged in learning experiences as part of their day-to-day work.

In relation to this the notion of communities of practice, as developed by the anthropologist Lave and organization studies researcher Wenger (1991), has been
useful for pointing out how groups of people engaged in learning and knowing as part of work develop and contest concepts and events that structure their life world. The methods used, according to Lave and Wenger, to make, structure and develop what they term communities of practice are different ways of organizing co-participation, including all resources needed for such an activity. In other words the collective framework created through co-participation is what structures what it means know and learn, which is radically different from saying that it is acquired knowledge that has conceptual structures that structures knowing and learning. Meaning making is thus not lodged in individuals, but within specific practices (groups of people) that share common concerns which they learn to tackle and develop through regular interaction over time. This happens through cooperation and mutual engagement that binds members together into a community of practice or social entity where collective learning goes on through attending to and developing social relations. How the communities of practice organize themselves and allow for social engagement is therefore central.

Lave and Wenger developed the notion of communities of practice when inquiring into apprenticeship models of learning. Learning through apprenticeship was at the time typically seen as a master – student relationship. What they found was that such a model was too narrow in its focus. It ignored how learning through apprenticeship builds on an encompassing set of social relations; namely of the community such a relationship is part of and which functions as a living curriculum. Learning is becoming a part of a specific life world, and not only learning specific tasks from a master, and it therefore does not make sense to separate learning activities from other activities; instead all activities need to be seen as learning activities. As such the learning curriculum that communities of practice have includes all resources the practice has within its domain. This can be contrasted to a teaching curriculum, which has an external perspective, delimits what resources should be used and what knowledge is. Learning not being a separate activity has therefore not a clearly stated intention of learning nor necessarily a clear beginning or ending.

Entering a community of practice as a newcomer means to step into an evolving life world with a specific way of perceiving and acting. This happens through what Lave and Wenger coined legitimate peripheral participation; participation that continuously evolves over time where new-comers move closer to the centre of the practice as they gain more experience and can take on more primary tasks. The newcomers engagement with practice, Lave and Wenger point out is not to be seen as a one-way learning process, but rather a mutual learning process where newcomer through their engagement as well change the practice since their participation entails a renewed set of relations. The centre as such is not to be seen as stable, but
continuously evolving precisely through renewed relations. Lave and Wenger thus saw the process of legitimate peripheral participation to be central to the development of communities of practice.

What Lave and Wenger point out is that different types of institutions or organizations with their distinct aims will operate with different ways of organizing and acting and therefore operate with different logics concerning what effective learning is. That the apprentices are at first let to take care of peripheral activities, as Säljö (2000) points out, depends upon the fact that learning should not disturb the everyday workflow and is therefore subordinated to the needs of production. Further he states that another feature that typically characterizes apprenticeship is the importance of loyalty toward the practice and the respect for authority. Also, here imitating and repetitive tasks are seen as valuable learning experiences. In contrast, learning within traditional schools, Säljö (2000) points out, a completely different logic prevails where imitating is viewed upon with suspicion while creativity and experimentation is considered central and failure even tolerated.

When Lave and Wenger established the notion of communities of practice it tended, in many of their examples, to correspond to specific work practices. However, what defines communities of practice is a commitment to shared concerns through collaborative activities. Belonging to communities of practice is thus not simply belonging to a specific profession or organization. At the university hospital at Malmö there are many doctors, nurses and nurses’ aides, who belong to the same organizational network and have the same profession, but that never engage in collaborative activities of sharing experiences in order to learn from each other. As such they are not engaged in building relationships or shared competence and cannot be said to be engaged in community building activities. On the other hand communities of practice do not need to collaborate on a day-to-day basis or be locally bound. What defines a community of practice is instead “a more encompassing process of being active participants in the practices of social communities and constructing identities in relation to these communities (Smith 2003). Further, it can be said that we belong to many communities, which are organized differently, which demand different skills, where we have different identities, and where our level of engagement varies. Also, some communities exist only for a short time while others can have a long standing tradition.

Membership is therefore revealed, as Lave and Wenger (1991) argue, through competent action. The participants are pulled together when they mutually engage in shared activities. It is through persistent practical action that a shared repertoire of resources is developed. These resources are for example stories of important experiences, artifacts, ways of talking, and customary ways of tackling problems.
Central to communities of practice is not only what they do, but also their shared identity; what they are about and how they perceive themselves and how they want to be perceived. The mutually shared ways of knowing as well as their identity is continually transformed through negotiation of ideas, stories and commitments that have been built up over time. By stressing that communities of practice are also about relational identity Lave and Wenger point out that learning is learning to talk and act in specific ways. The negotiating nature of communities of practice also points out that learning can be full of conflicts and different agendas.

The notion of communities of practice, although from the beginning seemed to closely correspond to local delimited work practices with formal apprenticeship systems, has come to mean any form of group activity that draws together people to actively and practically engage in a specific domain that concerns them. This points out that there may exist several communities of practice within a local practice and even cutting across practices and organizational boundaries and that the practitioners may belong to several of these practices more or less intensely. As such the intensive care unit and the hand surgery could be viewed as communities of practice each with their distinct common concerns. But perhaps more interestingly the notion of communities of practice points towards how multiple communities of practice exist within a local practice and that communities within communities may emerge from activities and develop as the local practice evolves. Thus at the intensive care unit the nurses could be said to belong to the intensive care unit community of practice, but simultaneously they could be said to belong to other communities of practice as well such as their work team, the case team, the wound group, and non-defined non-formal groups which more or less also connects to other intensive care units or other clinics depending on the concerns that engages them. The same obviously goes for the hand surgery clinic. Such a view of communities of practice points toward a much more multilayered and multifaceted view of local practices.

### 3.2.3 Reification in participation

Although the notion of communities of practice emphasized that learning happens through becoming an active member in a community of practice including all their resources they did not in any detail discuss the role materializations within practices play. Wenger (1998), however, more recently presented an attractive way of discussing relationship between material instantiations and practice, which in many ways avoids the dualism of agency and materiality encountered so far. What he proposes is that a fruitful way of viewing reifications, which can be said to be
materializations such as paper documents or utterances, as closely related to participation. Participation meaning the “complex process that combines doing, talking, thinking, feeling, and belonging. It involves our whole person including our bodies, minds, emotions, and social relations” (Wenger 1998, p. 56). Reification meaning the “process of giving form to our experience by producing objects that congeal this experience into thingness” (Wenger, 1998, p. 58) Making reifications means thus the temporarily hardening or solidifying of experience, which in turn negotiations are organized around. They are closely related to Schön’s (1987) notion of naming and framing, although he tends to emphasize the individual as a unit of analysis, Henderson’s (1999) notion of conscription devices and Star’s (1989) notion of boundary objects. These reifications besides establishing a focal point have the qualities of being (potentially) persistent, portable and succinct. That reifications can be succinct is precisely because they are made as part of participation within a community of practice which repairs the limitation inherent in any form of reification. In other words rich context allows for small amount of content. Wenger, however points out that reifications can be problematic such as when they are followed blindly without any deeper understanding. Reification are therefore ‘always incomplete, ongoing, potentially enriching, and potentially misleading’ (Wenger 1998). Reifications and participation are what constitute according to Wenger a shared repertoire and are reciprocally affecting and developing each other. In other words a central way of developing practices is by negotiating meaning through reifying aspects of the practice and than trying out these reifications in participation and so forth.

As described in the field studies the healthcare professionals use a range of reifications that precisely receive their meaning in participation. Texts fragments taped on the medical equipment such as “Obs! The Strenght! or “Morphine” can obviously only be understood in relation to close participation. The staff was also engaged in developing various work routines and work documents such as the intensive care unit supervision sheet, which can be seen as reifications, which are developed and redeveloped in close participation. The staff at the hand surgery clinic likewise would use their own hands to reify for each other aspects of the treatment being discussed. The surgeons would frequently make drawing for the patients to clarify for example how they planned to operate the injury. Wenger’s notion of reifications has also been an attractive way of discussing how the self-produce rich media material made at both the intensive care unit and the hand surgery clinic function well in relation to close participation.
3.3 Space as socio-material relations within communities of practice of differently positioned actors

I have just emphasized how meaning making is an ongoing achievement and defined through the social framing, and that these immediate circumstances are lodged within communities of practice which share common concerns and have established ways of perceiving and acting in the world. The notion of communities within communities of practice pointing at that practices consist of various intersecting and partially overlapping communities. I have also argued, through the notion of reification in participation, that reifications or materialization in one form or another are important elements for sharing and negotiating meaning within and across communities of practice.

I will now turn to another view, namely Actor-Network theory (ANT), which views space as consisting of ontological relations of human and non-human elements. This perspective, just as the notion of communities of practice, argues that meaning is relationally defined and constantly negotiated. Just like the notion of reification in participation it also argues that meaning is negotiated through reifications or through material forms such as artifacts.

According to ANT meaning making in other words is not just located in the social as suggested by Dourish, Fitzpatrick, Ciolfi and the early writings of Suchman, (which she has revised as will become clear). In fact as a designer, after having read Suchman’s Plans and situated action (1987), one easily feels that designing interactive artifacts is impossible since they to more or lesser degree will standardize and constrain human behavior or fail since they do not measure up to human-to-human interaction. The divide between human agency and machine seems to be total and unbridgeable. As Nardi (1991) has argued, Suchman in Plans and Situated Action, to some degree seems to propose that a conversational model is what interactive systems should be measured against. It is hard to disagree with that human intelligence or know-how can never be captured, fixated and preserved in any large extent as Dreyfus & Dreyfus (1986) and Suchman (1987) have showed and Benner (1984, 1996) and Josefson (1988, 1991, 1995) within healthcare have argued. Plans and routines can only function to a certain extent; competent action does not follow scripts for action. These are well-grounded objections that experts systems or agents cannot understand or speak like humans, but there is another side to the coin. Nardi (1991) has argued that formalized conducts and formal artifacts for notations have their purpose and are meaningful for human conduct and often used within professional practices. I just accounted for how Wenger also has pointed out
how reifications can be valuable in close participation and play an important role in moving practices forward.

Berg (1994, 1997), the technoscience researcher on healthcare, along similar lines argues that guiding documents should be seen as interactional; documents and standards are working documents that help to organize and shape the practice. Central to his argument is that such formal tools as guiding documents, standards and expert systems should be analyzed and evaluated according to how they are used, rather than how they are said to function or should function. This is a pragmatic standpoint that goes against both the advocates and the opponents of formal tools within healthcare. The advocates have argued that healthcare practices need to become more scientific and standardized. Unreliable and weak humans need formal tools that they can follow to improve their performance. In this view learning and knowing is a simple matter of transference and what constitutes as knowledge is externally defined. Where on the other hand the opponents argue that formal models cannot capture human know-how and competent action, which is holistic and intuitive rather than rule following as described by Dreyfus and Dreyfus (1986). Competent actions cannot be “replaced by detached, objective “knowing that” (Berg 1997, p. 6). A view put forth by for example the nurse researcher Benner (1984) and nurse’s aide researcher Josefson (1988, 1991, 1995). Both Benner and Josefson locate knowing solely in the social where in particular Josefson sees knowledge based technologies at best as hampering competent judgment.

The problem with both sides, as Berg (1997) argues, is that they view tool and practice as two distinct categories that have “…fundamental properties which are to be listed and compared. Both critics and advocates want to judge the actions of formal tools in comparison with those of human experts, and query whether the tool is and adequate representation of the structure of medical practice” (Berg 1997, p. 161). Framing the problem in such a way is, however, unfruitful, since the qualities of tool and practice are not pre-given. He therefore proposes that we should instead focus on how tool and practice have coevolved through highly historically contingent intertwined trajectories. As he states: “It is not because the research protocol is so rational that it has become so widespread: the specific rationality and shape of decision techniques emerged together with the development of these tools and the specific configuration of their use” (Berg 1997, p. 164). In this view documents such as research protocols are not standards that can in a simple way be operationalised, rather they help to organize and shape the practice. But they never fit easily to practice and what the document should contain demands considerable amount of negotiation by the participants. The documents and practices are thus reciprocally dependent upon each other and reshape each other (Berg, 1994, 1997).
short, what he proposes is that we need to pay attention to how tools and practices converge in a complex translation process where both the tools and the practices recursively affect each other and are highly intertwined. This is much in line with an anthropological view of learning, which emphasizes learning, knowing, concepts, and tools to be highly intertwined and ANT’s view, which Berg is indebted to.

The reason for turning to ANT is because it points out how space is relationally defined and cannot be easily pinned down to a particular location or instance, but rather is spread across space and time. Another reason is because it is an intermediary position emphasizing how the material, the artifactual, or the technical are given meaning in relation to other entities both human and non-human. Likewise human activities are partially defined through their usage of artifacts. Both can thus be said to be given meaning through how they are connected to heterogeneous networks. ANT thus points out that we need to study how tools and practices have coevolved out of specific historical intertwined trajectories, rather than seeing them as discrete elements that should be analyzed separately. This has been particularly useful for analyzing our own design processes and how the different actors in the project have negotiated partially through inscribing meaning into artifacts. Last, ANT has been useful for pointing out how materializations contain rules and conventions, or more precisely that it is through materializations that rules and conventions are partially made strong and durable and thus often difficult to change (Latour 1991).

As Callon (2001) puts forth, ANT has aimed at overcoming the duality of not only agency and artifacts but also the duality of agency and structure and that of micro- and macro analysis by providing analytical tools for how actors and networks are constructed or constantly reconfigured. (Society accordingly is not seen by ANT as consisting of a priori structures). According to ANT, society is continuously being made up, maintained, and assembled. With a focus on society in the process of being made actor-network theory is particularly interested in science and technology, which play an important role in making society.

For ANT it is misleading to view non-human elements such as artifacts organizations, rules and procedures as elements of context, a frame for action. By viewing them as existing outside the social collective nonhumans are treated as inferior to humans. This ontological asymmetry between humans and nonhumans, or the social and the non-social, is foundational to the social sciences. ANT instead argues that nonhumans can act through a spokesperson, which can be made to write. To actor-network theory nonhumans and humans are equally active and have been translated, and connected to one another in configurations that are continuously evolving. This symmetry between humans and non-humans is, however, an ana-
lytical rather than an ethical standpoint as Law (1992) states. Society in other words is not just made up of humans, but nonhumans as well and both elements are relationally defined.

This, as Callon (2001) points out, has several consequences. One such consequence is that macro- and micro-levels are erased and replaced by “connected realities.” Within sociology it has been debated how to account for institutions and organizations, since only interactions between individuals is what can be observed. At the same time it is difficult not to account for or bracket off institutions since they affect individual agents. Actor-network theory proposes that action can be seen as simultaneously connected and framed. This connected and framed action can be seen as locality consisting of human and nonhuman elements that are present. The meeting between a patient and surgeon happens in a frame that holds them. Without the frame, as I earlier noted, the conversation between the two parties would not make sense. In other words all interactions have a framing that contains them. Actor-network-theory’s notion of framing is highly related to Goffman’s (1996/1974) view of social framing, but extents it by emphasizing the active part that non-humans play. Returning to the doctor’s visit the surgeon and the patient are assisted by nonhuman elements, inscriptions that are made to write such as x-ray images, journals, and various instruments.

At the same time that the framing defines a place and constrains the interaction it also connects it to other places. The doctor’s visit again connects to previous meetings between the patient and the doctor and for the surgeon to previous patient cases that have had similar injuries. The patient condition relates to his or her home condition and the type of work he or she performs. The injury further in many cases also connects to the social insurance office, and so forth. Microstructure, as (Callon 2001) states, is now replaced by locally framed interaction; macrostructure is replaced by connected localities and points at that the actants active in any given situation are more numerous than at first considered. As such it is now possible to avoid talking about micro- and macrostructures as different levels while explaining how difference of power is accomplished. Power or the ability for mobilization relies on to what degree a place is connected to other places. In other words the more a place is connected to other places the more powerful. Powerful places, according to ANT, are termed translation centers. The translation centers are places where inscription converge and are access points to numerous other heterogeneous entities.

Local framings from an Actor-network perspective with its emphasizes on connected realities, is far from the traditional view of culture within anthropology, which as the anthropologist Hastrup points out (1996) has tended to view cultures as stable frameworks that can clearly be delimited. This she points out, is strongly
related to the fact that anthropology as a practice developed within western countries where nationalist thinking was predominant. Other cultures, preferably far away and exotic, that anthropologist studied focused on natives that stayed in one place, marginalizing or ignoring transitory elements in the culture, such as migration or their contact with the so called outside world. The cultural geographer Massey (2004) along similar lines argues for viewing space as extrovert and created out of interrelations on a local as well on as on a global scale were the identity in the relations is not pre-given and stable. Further, she argues that we need to understand space as consisting of coexisting heterogeneity or the simultaneous coexistence of histories. And because space is the result of interactions it is always under construction and unknown rather than known as in many modernist narratives of progression.

Conceptualizing culture as networks of relations or nodal points, as Hastrup (1996) argues, points towards how culture is mutually constructed through ongoing encounters between cultures. Further it points out how culture is not a pre-established social frame neatly localized, but rather a dynamic process constantly being redefined by its practitioners. Space, in the word of de Certeau (1984) is a practiced place, and “practices overlap, intersect and blur the boundaries of place to the extent that we may speak of a continuous global place in the analysis of certain places” (Hastrup, 1996, p.4). This means that change rather than structure is the condition of culture and as such needs to be foregrounded rather than treated as an anomaly.

However, moving away from viewing culture and place as a local stable frame to network of relations or nodal points tends, however to miss how networks of relations are locally bound or grounded. (Castell’s (2000) has for example been criticized for focusing too heavily on the global transactions and connections, ignoring how the local places are transformed through the connections). Hastrup argues therefore that the locally bound cultures should be viewed as “focal points of identification for people who, in their daily lives, are involved in complex relations of global as well as local dimension” (Hastrup 1996, p.11). Anthropology can as such study how place is constructed as a result of processes of human life within a historical context. This is similar to ANT’s argument that we can only study a series of local framings and how such framings connect to other local framings. I would also like to emphasize that the analysis of the two projects put forth in this thesis will focus on the local work conducted at the respective work practices and only occasionally point out how these practices connect to other spaces.

As earlier noted ANT argues that physical elements, such as artifacts, are central to human relations and often play an important role in stabilizing a network of
relations. Latour (1991) even goes so far as to claim that nonhumans make society durable. In fact it is through materialization that rules and conventions are made strong and durable and thus often difficult to change. Latour (1991) exemplifies how rules and conventions are inscribed by explaining how a hotel manager enrolls hotel guests to follow his inscriptions of returning the hotel keys when signing out from the hotel. To begin with the hotel guests are verbally reminded that they should return the keys, which does not work. Therefore a sign reminding the guests to return the keys is set up without any success. It is first when the manager decides to attach an ungainly and heavy extension to the keys, which makes it problematic to carry the keys around, in combination with verbal and written reminders that the hotel guests start returning the keys. As such the material formation of the keys are actors in a network consisting of guests, and hotel personnel, the signs set up, and the convention and rules needed to stabilize the hotel guests conduct of behavior. Through the formation of the keys the hotel manager has in other words successfully inscribed the need to get back the keys into material form.

Inscriptions as such according to Latour (1992) and Callon (1991) connotes when human interests are translated into material form. To Callon there are four types of intermediaries; literary inscriptions, technical artifacts, human beings, and money. Literary inscription referring to patents, notes, reports, books, and so forth; technical artifacts referring to machines, consumer goods, etc; human beings referring to the skills and know-how they embody for example how they decide and know what interests have been inscribed in different social situations such as meetings. Callon (ibid) points out that it is through inscriptions, which are a form of intermediaries put into circulation, that the actors define each other. Central to actor-network theory is therefore to study and account for how inscriptions affect the actors’ performance and in how agreements and stability is achieved as they go about defining each other. Stability and agreements thus is dependent upon how well the different actors have been able to negotiate and translate their interests into material form. Translations as such consists of three elements; “it involves a translator, something which is translated and a medium in which that translation is inscribed” (Callon 1991 p. 143). Agreement and stability, as Law (2001/1987) illustrates, is dependent upon immutable mobiles. Without inscribing interests into material form or establishing immutable mobiles, such as trained seamen, documents and devices used for sailing, the Portuguese in the 17th century for example would not have been able to travel to India. Similarly, scientists are dependent upon not only constructing facts in local laboratories, but also dependent on letting such facts travel around and comparing their facts to other scientists’ immutable mobiles. Even though Law emphasis that stability is essential to networks, he together
with Mol (2000) has more recently acknowledged that some networks can be simultaneously stable and unstable. Some networks diverge and change their shape and continuously shift between stability and instability and as such are more like fire and fluid spaces.

As I perceive it, designing from an actor-network perspective means inscribing interests into material form or patterns of use. And as actor-network proponents point out inscriptions are not discrete entities, but rather establish their pattern of use through how they link to other human or non-human elements. From an ANT perspective the design experiment have centered on new ways of combining heterogeneous elements and how they connect to and redefine already established inscriptions and entities in the network.

### 3.3.1 ANT, asymmetry, partiality, and multiplicity

Even though actor-network theory provides several insights into how to deal with how humans and nonhumans are connected and thus how space and human action materializes it has problematic sides. Although Star (1991) agrees with Callon and Latour that the human and the non-human intermingle and that networks black-boxed should be unveiled or deconstructed she is critical of what Star calls their focus on managerial and entrepreneurial aspects of heterogeneous networks, since it ignores marginalized actors who’s work is made invisible. This is exactly what also happens with standardized technologies. Instead of focusing on the managers and the entrepreneurs or the people for whom the standards are unproblematic and stable she proposes that we should pay attention to those marginalized by the standardized networks. In other words we should not only show how human and nonhuman mingle and have been made durable, but also ask who benefits and who is marginalized by it. We should in other words not ignore “differences in access or experience” (Star, 1991, p 43) as for example Latour (1988) does in his example of the sociology of the door. Conventions and standards such as doors are in fact never stable for non-members such as users of wheelchairs.

A stabilized network is only stable for some, and that is for those who are members of the community of practice who form/use/maintain it. Standardized networks create stability but also private suffering of those who are not standard – who must use the standards network, but who are also non-members of the community of practice (Star, 1991, p. 43).
Therefore she suggests that we focus our analysis on those marginalized because they show us that the standards might be otherwise. But, further she points out that being marginalized is not simply a question of being inside or outside the communities of practice and their standards. Instead we should acknowledge that we are all members of several communities of practice where we all more or less are aligned and more or less marginalized. Star relates her argument that we belong to several communities of practice to Haraway’s vision of the cyborg and therefore states that:

The vision of the cyborg, who has membership in multiple worlds, is a different way of viewing the relationship between standards and multiple selves. And this involves weaving in a conception of multiple memberships, of a cyborg vision of nature (ibid p. 48).

As such both Star and Haraway wish to acknowledge multiple and differently situated perspectives, which will hopefully allow marginalized views to be put forward. At the same time both authors remind us that marginalized others also have their partial views, are not innocent and have their biases, and we should therefore be careful in romanticizing them.

These authors emphasize the hybrid nature of our existence and that we constantly create, affect and are affected by different forms of reifications that standardize human conduct. Meaning making to them is not simply located in the social or artifacts, but in the ontological relationship between human and non-humans. More recently Bowker and Star (2002) have drawn attention to that classifying and creating standards are human activities that are ubiquitous; we standardize and classify all the time and our classifications and standards to some degree organize our work. In other words they are not only affected by human conduct, but also affect and change human lives. And these standards and categories are often highly invisible; hidden in technologies and social conventions.

Returning to Suchman it should be said that she to some extent revised or reconsidered the relationship or boundary set up between human and machine agency in her article Human/Machine Reconsidered (2004). There she states that with her initial critique she fell into a classical humanist trap of making a clear distinction between humans and non-humans. Bridging or blurring the distinction between human and non-human Suchman acknowledges the performative character of agency as argued for by researchers within technoscience. Within technoscience, as earlier stated, agency is not seen as belonging to humans or non-humans, but rather in what Latour (1993) calls the Middle Kingdom, which is the space between
translation and purification. Translation connoting those practices where agency is shifted between humans and machines. Purification on the other hand meaning “those practices through which boundaries are maintained as clear and distinct” (Suchman 2004, p. 4) As such agency is material – semiotic attribute made out of human and nonhuman materials or a “network which configures ontologies,” (Latour, 1997) rather than of connecting entities. Similarly, as technoscience studies have shown, Suchman points out how Goodwin’s (1994) notion of professional vision also argues against attributing agency either to artifacts or to humans, but rather in the traffic between the two. The Munsil color chart “embodies archeological knowledge” (Suchman 2004, p. 5) simultaneously as the archeologist needs to be skilled in reading the chart. Suchman goes on to state:

The problem is less that we attribute agency to computational artifacts, than that our language for talking about agency, whether for persons or artifacts, presupposed a field of discrete self-standing individuals.” “Modernist epistemologies... treat agency as something both independent of and contained within singular entities, whether humans or artifact” (Suchman 2004, p. 5).

Although Suchman agrees with the blurring the boundary between human and nonhumans, and in doing so recognizing the hybrid and cyborg character of human artifact relationship, she objects to the technoscience claim that humans and artifacts are mutually constitutive or specifically to Latour’s definition of actants as “something that acts or to which activity is granted by others. It implies no special motivation of human individual actors, or of humans in general. An actant can literally be anything provided it is granted to be the source of an action” (Latour 1997, p. 7). This supposed symmetry between humans and artifacts and their role in network configurations tends to relegate humans to the margins. What Suchman proposes instead is “an ontology that tie humans and nonhumans together without erasing the culturally and historically constituted differences among them” (Suchman 2004, p. 6 – 7). As such, she suggests that we need to keep in mind that humans initiate technological projects and decide how technologies should function. Further, that we need pay attention to how things travel across the human artifact boundary or in other words how objects are subjectified and subjects objectified. Loosing sight of the asymmetry of humans and artifacts risks obscuring the authorship of the technologies, which in turn renews the power of the technologists in the same fashion as science is legitimatized through obscuring human agency in analyzing nature.
Drawing upon the epistemological feminism of Barad (1998), Suchman argues that we need to refigure the boundaries between humans and agency and in doing so acknowledge that they are different although highly intertwined. This reconfiguring is necessary Suchman argues firstly because we need to “recover certain qualities – interactive, intelligence – from trivialization” (Suchman 2004, p.8) Secondly because we need to “restore authorship and thereby accountability to our relationship with artifacts” (ibid, p. 8).

### 3.3.2 Design and meaning making

I agree with Suchman that interactivity and intelligence cannot be to a large extent inscribed into artifacts and I agree that we need to acknowledge our authorship of them. It is therefore in light of this highly problematic that Dourish & Harrison argue that we cannot design place, we can only design for place (Harrison & Dourish 1996). Although it is reasonable to say that designers cannot design a whole life world, it is unreasonable and even deeply problematic to argue that the creation of meaning is only managed by the users. The argument put forward by Dourish relates to his view on the technical as having no agency. This becomes fairly clear when he argues that “the meaning itself may, by definition, be something that can never be removed from the social world and encoded in the technical. Nonetheless, though, technology plays a critical role in the evolution of meaning within communities of practice” (Dourish 2001, p26). But as Matthew Chalmers points out it is too constricted to state, as Dourish does, that the “users not designers, manage coupling, and contextualisation” (Chalmers 2004, p. 227). Designing always involves objectifying, formalizing and through these acts of formalizing will constrain and influence human behavior. The designer, although not predetermining the meaning, will inevitably influence how the users will manage coupling and contextualization; even though not present in the immediate circumstances when the system is used.

And as Star has pointed out, any system or classification will be empowering for some and constraining for others no matter how flexible they are. She cautions that we should not fall pray to “the chimera of infinite flexibility” as if it was just “a matter of expanding the exhaustive search for ‘special needs’ until they are tailored or customized; a belief held strongly by many builders of knowledge-based technologies” (Star 1991, p. 36). What Star seems to point out is that we need to be aware of such naïve believes that proclaim that an optimal convention, standard, classification or systems is possible to accomplish. Any convention, standard, classification or system will in one way or another fall short in some regard whether global or local.
Further, I would want to call attention to that arguing that we only design for place not design place, a standpoint taken both by Dourish and Ciolfi, risks ignoring and hiding the power that design explorations and design solutions can have. If we do not acknowledge the meaning-making aspects of design experiments we risk trivializing the designers potential power of influencing the course of other peoples actions and in a sense are black boxing and naturalizing the outcome; making it seem inevitable and as such a design from nowhere. In other words we risk performing what Haraway (1991) has critiqued science for doing; namely erase the embodied and subjective aspects of our practices. Playing the God-trick as Haraway calls presenting the views of science, and as I want to add that of design, is doing away with the cultural and a political aspects of our practices. But, as she argues, knowledge can never be from nowhere, rather it is always from somewhere, and as such we must speak of embodied and historically and geographically located subjects with partial perspectives rather than disembodied objective universalism. In Haraway’s words: “I am arguing for politics and epistemologies of location, positioning and situating, where partiality and not universality is the condition of being heard to make rational knowledge claims” (Haraway, 1991, p. 195). These partial perspectives happen within complex networks and rather than aiming at homogenous views we should allow difference to endure; recognizing multiple and differently situated perspectives.

Building on Haraway’s situated knowledge Suchman argues for what she calls located accountability. She suggests that we need to move away from viewing technological production as the production of discrete devices or network of devices to “system development as entry into the networks of working relations – including both contests and alliances – that make technical systems possible” (Suchman 2000 p. 2). Viewing the development and production of technology and the technology itself as discrete devices is committing to a design from nowhere and “obscures responsibility for the relations of technology production and use” (ibid, p. 6). This is, she further states, typical for the construction of commercial technical systems that can “be stabilized and cut loose from the site of their production long enough to be exported en masse to the site of their use ... while they demand continual relations of development, support, and redesign” (ibid, p. 5). While such design practices are detached from the specific sites of use they are intimately and deeply enmeshed in a self-referential practice, which is not challenged by other practices and views. Alternatively Suchman suggests that we need to work at crossing boundaries between different stake-holders within the technological production and between technological developers and user. Referring to the Scandinavian model of system development she states that:

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...in order to develop systems with any integrity, must develop them in relation to the specific settings in which they are to be used. Similarly, if technologies are to be made useful, practitioners of other forms of work must effectively take up the work of design, as those activities currently glossed under the notion of technology adoption; that is, appropriating the technology so as to incorporate it into an existing material environment and set of practices. Integration, local configuration, customization, maintenance and redesign on this view represents not discrete phases in some ‘system life cycle’ but complex, densely structured courses of articulation work without clearly distinguishable boundaries between (ibid, p. 3).

Suchman therefore suggests that we need to pay close attention to the visible and invisible work that producing and using technical systems entails. We also need be responsible participants that reflect about where we locate ourselves in an “extended web of connections” (ibid, p. 11) when developing new technological systems. Further, she proposes that we should value heterogeneity, over homogeneity and domination in technical systems. As I hope will become, clear when I turn to analyzing the projects, is precisely that we have aimed at valuing heterogeneity. Also, that we have aimed at being responsible participants thinking about where we have entered the web of relations as well as paying close attention to how the artifacts introduced relate to the existing webs of relations and what actors are engendered and constrained by them.

### 3.4 Summary

This chapter started out with discussing different analytical perspectives on space and place within interaction design. By analyzing the different analytical perspective put forth I point out how meaning, coupling and contextualization with interaction design typically is seen as arising in the immediate activity and completely located in human agency. Although I in many ways agree with these perspectives, they have their problematic sides. First of all, they undermine how immediate activities relate to other times and is influenced by other actors or places not immediately present. Secondly, it locates meaning making completely in the social, rather than seeing the social and the material as highly intertwined. Thirdly, notions of space and place within HCI and interaction design have to a very little degree accounted for how a place can be highly diversified and contested.

Subsequently, I put forth perspectives that view the social and the material as highly intertwined. I have presented socio-cultural views of learning and knowing,
which emphasize that learning and knowing happens within a social-framing within communities of practice; perspectives useful for locating meaning, coupling and contextualization. The notion of communities of practices entails viewing learning as an all encompassing process, rather than just the immediate circumstances of learning between a teacher and a learner. Learning is learning to act competently by accessing all resources, including the concepts and tools, that the community possesses. The notion of communities of practice also points towards how work practices can consist of multiple overlapping and intersecting communities of practice within communities of practice. The conception of reification in participation within communities of practice is also presented as a viable way of going beyond the agency – artifact dualism. I thereafter present that notion of connected realities and heterogeneous networks from ANT as a useful perspective for locating meaning coupling and contextualization as stretched across a network of relations consisting of both human and non-human element. This perspective has the advantages of accounting for in more detail how tools and practices are highly interrelated. Although actor-network theory provides for an analytical perspective that includes non-humans and how society is made stable and durable, it has it problematic sides. ANT in its eagerness to describe how society is made stable through material manifestations, does not account how these stable networks are only stable for some. As such we need to pay attention to how new materializations of standards affect the different actors. I conclude that designers need be highly sensitive to the fact that meaning, coupling and contextualization happens across complex networks of relations. Designers need therefore to pay a close attention to where they locate themselves and the artifacts in the networks of relations entered.

We will now turn to a methodological discussion pointing at how both design projects accounted for in this thesis have been conducted as open-ended processes where healthcare practitioners and designers have negotiated through material form how tools and practice should intertwine.
Design research implies researching not only into what is but how things could be different. As I have argued interaction design is not designing discrete artifacts, but rather socio-material circumstances where designed artifacts play an important role in facilitating and mediating and structuring human action.

Both research projects discussed in this thesis have started out with quite open-ended research questions concerning how media and new information technology can support informal learning within professional practices. In the first project the intensive care unit approached the university wanting the researchers to inquire into how their practice could improve their competence development through the use of information technology. In the second project, the hand surgery clinic was approached by the university and asked if they would be interested in exploring how collegial and patient learning could be facilitated with the aid of new media and new technology. Both projects have therefore been conducted through interventions within professional practices with the intention to inquire into how new media and new technology potentially and desirably could change aspects of the practices. The intention of the inquiry has not however (only) been to inquire into how these particular practices could be affected or changed, but also to generate new knowledge useful for other practices and designers and design researchers concerning the questions addressed. Methodologically this requires the researcher to
consider and argue for how it is possible to research through interventions, but also how specific issues addressed are made valid to other researchers.

The chapter begins by situating the research approach within the Scandinavian tradition of participatory design. I emphasize in particular design and design research as a collaborative learning process partially carried through dialogues and enactments around artifacts. These collaborative learning processes can be seen as the meeting of communities of practice that challenge each others through an open-ended process of negotiation partially through artifacts. Participatory design, as a research orientation, has it roots in action research. These two traditions have in common that they take as a starting point the concerns of particular practices and aim at liberating change through active engagement and interventions. Methodologically both traditions also have frequently leaned against ethnographic methods, which has also been the case in the two projects accounted for here. I therefore shortly describe how ethnographic perspectives and the use of video documentations have inspired the research approach. Working within these traditions means that the validity of the design results depends foremost on how meaningful those designed for find the changes, but also to what extent the researcher have considered different design alternatives and what stakeholders have been taken into account.

The second part of the chapter presents in a chronological order the activities carried out in the project to construct data. First, the activities carried out to construct data at the intensive care unit are presented. Thereafter the activities carried out in the hand surgery clinic project to construct data are presented.

The chapter ends by discussing how connecting the constructed data to concepts from various fields, which is a form of translation that changes the data constructed and the concepts, terms and notions used. Connecting the data to debates and concepts from various fields brings forth certain aspects of the data, which otherwise would not have been shed light on. The arising articulations are, however, not irreversible, foundational or result in any easy guidelines that others should follow. Although I agree that design as a science can gain from developing their own concepts and terms, I argue that design research has much to gain from connecting to and borrowing concepts from other disciplines. What connections are to be made depends on the issues addressed in the research project pursued as well as what one’s own discipline considers to be valid ways of connecting.

4.1 PARTICIPATORY DESIGN

Participatory design is today an established design approach, and has frequently been used as a design research approach. Within Scandinavia, participatory ap-
approaches to system design, known in the beginning as the Scandinavian approach and The Collective Research Approach, had its roots in participatory approaches to work practice development driven by labor unions. Common to these research endeavors spread across Norway, Sweden and Denmark was a commitment to democratic ideals and taking workers’ skills seriously. In other words, workplace development, system design and system design research needed to take the skills of the workers, which was being designed for seriously, which meant that those affected by the design changes should have the democratic right to be involved and represented in these change processes. Participatory design has thus emphasized the need to involve actively ‘end users’ throughout the design of IT systems for a particular organization (Greenbaum & Kyng 1991). Central to participatory design is a respect for practitioners’ competences and that they should be viewed as creative and communicative resources. Also, advocates of the tradition argue for the importance of including all important perspectives to the design of the system regardless of their organizational status and in particular make sure that resource weak groups are included. Further, that researchers and designers should aim at understanding the practice from the practitioners’ point of view and take their problems and needs as a point of departure when developing new technological systems. Proponents of participatory design have also emphasized the need to see technical systems as socio-technical practices which includes both human and nonhuman elements in contrast to seeing systems simply as discrete tools. When developing new systems the participatory design emphasize that the systems developed should enhance practitioners’ skills, their need to communicate, and engender creativity and control of their working lives.

Designing new technical systems through collaborative explorations has typically been seen as a collaborative learning process where researchers or designers learn about the situated work practices and the users learn about design methods from the researchers or designers (Ehn 1988, Ehn & Sjögren 1991). Through collaboration the different stakeholders can create a shared albeit different understanding of the present condition and a shared vision of alternative futures of the technical and organizational actions. As the field of participatory design matured participatory processes have typically included ethnographically inspired studies of the practice, interviews and dialogue through for example design games. Thereafter end users are involved in iterative design experiments where prototypes are developed and evaluated. A final system is typically put in place with the involved users acting as advocates for the chosen design.
4.1.1 Design, language games and communities of practice

Within the tradition of Scandinavian approach or participatory design Ehn (1988) has suggested that the dialogue between designers and the practitioners designed for could be viewed as the meeting of language games. The notion of language games, which Ehn (1988) derives from the late philosophy of Wittgenstein (1963), points toward how language and meaning-making in general, is lodged within different practices or is defined by practical affairs. Mastering specific language-games means therefore to master practical rules, which have developed over time. Language-games thus points toward how meaning making is a social affair, where the only way to know the language-games is by participating in a shared life world were the language-games are practiced or in other words where they are used. (Language is here understood not only consisting of words, but action partially in the form of tacit knowledge, i.e., knowledge not articulated but enacted). Mastering the rules of a language-game does not necessarily imply that the rules can be explicited by the practitioner; rather it suffices that the practitioners can competently act according to the rules. Rule following according to Wittgenstein (1963) does not imply that the practitioners slavishly follow a set of clearly predefined explicit rules. Instead rule following demands skillful interpretations of the rules that are not necessarily well defined and which also are open for change. As human beings we participate in endless language-games such as different types of sports and different types of work. A nurse participating in the language-games of nursing means entering into a the tradition of nursing that consists of practical skills that are performed in legitimate ways as well as learning and understanding what specific terms mean within that particular tradition. Being asked to change a central venous catheter means that the nurse knows in the first place what this term means and secondly that the nurse can competently change it; avoiding infections, that air bubbles enter into it, knowing at what intervals it should be changed, etc. Likewise nurses can recognize when it is not performed correctly as well as develop new ways of competently set up a central venous catheter.

In our lives we encounter constantly language-games that we are not part of, but that we partially can understand and even become part of if so desired. This is, as Ehn argues (1988) while referring to Wittgenstein (1963), because many language-games share a family resemblance and is what makes it possible for designers and practitioners to learn partially each others language-games and even establish new language-games that resembles their respective language-games. This in turn requires that both stakeholders learn from each others practices and Ehn & Sjögren (1991) therefore suggest that designing is a form of skill based participation. The
language-games of design are special in the sense that their aim is to alter others-
language-games. This is because designing is not simply designing artifacts, but also defining a set of rules for its use and therefore altering to some extent some of the language-games the practitioners are engaged in.

More recently Ehn, in conversation, has suggested that we just as well could view participatory design as “overlapping communities of practice.” The advantages, Ehn points out, is first of all that communities of practice emphasis practice and participation, rather than meaning as a central unit of analysis as is the case with Wittgenstein’s language-games. Secondly, the notion of communities of practice also points out how meaning making is constructed through negotiation and power struggles. Thirdly, it is not as language oriented as the notion of language-games is and pays attention to how artifacts are appropriated. In other words, it points towards how physical, social and the cultural aspects intertwine. This is also in line with what Wenger has suggested; that design could be seen as the meeting between communities of practice that challenge each other (Wenger in Binder 1996).

Within the tradition of Scandinavian participatory system design several methods for collaboratively exploring future use situations have been developed where the role of artifacts has been central. Just as previously argued, designers and practitioners within a particular work practice have different practices with their own culture and language. For practitioners to understand the IT experts communicative artifacts need to be developed that make sense to the different stakeholders involved; technical system descriptions being too tailored to the language games of the IT experts. Design artifacts that both the IT-experts and users can understand and that can move the design process forward are design games, mock-ups and prototypes. These design artifacts are concrete objects that have been shaped for the specific needs of the practice and enacting through them can elicit tacit aspects of the practice. Through these design artifacts the different stakeholders can engage in what Ehn and Sjögren have termed design-by-doing and through the active engagement with the artifacts create overlapping language games. The authors emphasize that the artifacts deployed should be seen in a Wittgensteinian way as paradigmatic. The qualities of the artifacts have nothing to do with how well they correspond to the present or future artifacts and their use. With the artifact the participants can reflect around previous experiences that can help the practitioners in forming ideas about paradigm cases on how future artifacts can be used. That the artifacts function as paradigm cases engenders the establishment of “open-ended game” of participatory action. These design artifacts do not have to mean the same thing for the different stakeholders. It suffices that they are meaningful for all those involved although that entails that different meanings are attached to them (Ehn & Sjögren
This is in line with the roles artifacts have been shown to have in design processes both by Henderson (1999) and Star (1995). The importance of mediating artifacts and the need for collaborative construction when moving from existing to emerging practices of learning and knowing has also been argued for by Engeström (1999). He has developed what is called change laboratories where different professional communities jointly explore their current practice and collaboratively envision organizational change. Specifically within healthcare Karasti (1997, 2001) has explored how studies of work practice can be joined with participatory design approaches through the aforementioned change laboratory. Wagner (2001) has also advocated participatory approaches that include patients in the development of information communication technology, where they currently are marginally represented, which leaves out an important perspective concerning what data is collected, how it is collected and who should have access to it.

Collaborative design processes have provided an attractive format for envisioning and anticipating future interactions (Blomberg et al. 1996, Ehn 1988). Participatory design, as Binder (2002) points out, has not always gone beyond the design process to study the situatedness of interaction. That design artifacts are appropriated and often redesigned after so called implementation is well-known. Hartswood et al (2000) have recently argued for taking the use of artifacts seriously as a source for design. They point out that today an abundance of off-the-shelf technology is available consisting of generic components that can be tailored and configured without a large technical knowledge. A bricolage ‘system’ is developed by combining different components.

In both research projects accounted for in this dissertation the collaborative exploration of future ways of learning and knowing have been explored through artifacts. In the intensive care unit project design games, mock-ups, and prototypes where used. In both projects when going from ethnographically inspired field studies to design a key factor has been small scale, iterative experiments in the midst of work paying close attention to how the content and off-the-shelf technology is used and affects an individual’s work, collaboration and the work practice culture. These kinds of experiments could be seen as a form of ethnography of content and technology-in-use. They resemble what Suchman, Trigg and Bloomberg call “occasioned practice of technology design and use” (Suchman et al 1998) that are direct and intense ways embodying interaction that “simultaneously reconfigures the work’s practice while maintaining its accountability of relevant professional and organizational constituencies.” Such an occasioned practice with prototypes does not in any simple way uncover users’ needs. Instead, the prototype is “constituted in and inseparable from those interactions” (Suchman et al 1998). They are also
akin to what Bloomberg et al (1996) call case-based-prototypes. Case-based-prototypes explore new technological possibilities through real cases that are informed by the users’ needs and their practice. In doing so, material from the worksite is incorporated. What is foremost looked for is the system’s usefulness, i.e., that the system makes sense and that it adds value to the worksite studied rather than focus on usability defined as the system’s general readability. The difference in the projects accounted for here is that we have looked at how new content in new use situations can be created with existing technology. From a research perspective being able to stage future use of technology in the midst of work has been essential because such experiments reveal clearly how the technology affects the practice and how the practice in turn reconfigures the technology.

4.1.2 Action research

Participatory design as a research orientation has its roots in action research. Action research originates with Kurt Lewin and John Dewey who both as Agyris et al (1985) state “executed action or demonstration experiments whose consequences they studied systematically.” In doing so they aimed at both solving practical problems simultaneously as they added to our fundamental knowledge. Further both saw research as means to accomplish a better society or in other words liberating alternatives to action.

Action research, which consist of different methods (Agyris et al 1985, Agyris & Schön 1996) and participatory action research (Whyte 1991) both start from concerns, as perceived by the practitioners, within a specific practice. These concerns, questions, or problems are addressed and solved through iterative interventions whereby descriptions, categorizations and theories are developed from within the context of study and alternative constructive actions are tried out. In other words action research focuses on finding constructive and liberating alternatives to problems as perceived by practitioners within local practices. Descriptions and theories of the problem are generated from within the practice rather than applying whole sale a theoretical framework onto a given practice. Research is thus delimited to the boundaries of the local context. The hypothesis, developed from the descriptions and theories, are than tested through interventions in the form of experiments, which causes hopefully a desired change in the situation (Agyris & Schön 1996). The problem solving aimed at through action research is not simply correcting the immediate problem, but rather aims at changing the underlying values that guide the practitioners’ action through reassessing or reframing the problem setting (Schön 1987). In other words, action research should aim at what Agyris and Schön

Researching as a design researcher the word “problem” has its problematic and unfortunate connotation. The HCI literature is full recommendations on how to define the problem and remedying it with a technological solution in a linear albeit seemingly iterative process of refinement. The same can be said of early design research (Cross 1984). In the two research projects discussed here we have found it more fruitful to look for qualities present in the practices that could be “augmented” with new technology and new media. In some ways, perhaps due to the problem solving tradition within HCI, it has been stifling and unproductive to think in terms of problems. At the same time it is obvious that we have worked in a Schön like way with redefining the problem setting. At the intensive care unit we redefined the initial problem posed by the unit as “how can everyone be made to do procedures in the same way?” to “how can people actively contribute to collaborative knowing at the clinic.”

Action research although emphasizing that descriptions and theories should be built from within a local context of practice and from the concerns facing the practitioners do not claim that the research comes theoretically empty-handed to the site of study. In The Reflective Turn Schön (1991) points out that the authors included in the anthology bring various theoretical concepts from different scientific tradition to the cases, but only so far as they illuminate the problems being described. They do not force the problems worked upon into a theoretical frame work, but let them lend a hand when analyzing the problems they are facing and construct an alternative form of action (Schön 1991). Agyris et al (1985) in Action Science states that action science has a clear agenda of being both critical and liberating and links action science to the critical theory of the Frankfurt school and the philosophy of Habermas. A basic assumption built into action research is that the status quo in many cases needs to be criticized and changed. Further Agyris et al (1985) argue that change will often unearth “what is” first when “what is” is challenged. And although some social scientists oppose the role of becoming change agents and argue that social scientists should ‘only’ describe ‘what is’ the social sciences have as Hughes et al (2003) point out not only been concerned with descriptions of societies solely for the purpose of generating knowledge. Marx, Durkheim, and Weber saw the role of the social sciences to unearth the structures and mechanism of society so that they could be changed. Social science has thus most often aimed at generating descriptions that prescriptive action could build upon or in other words how society could be different.
Although I ascribe to the notion of action research and participatory design research should have a critical and a liberating role, I am also aware of the problems that such a stand point can entail. I wish to emphasize the need for self-reflective and critical assessment as Schön (1987) also emphasizes, or for reflecting on the language-games of design research as argued by Ehn (1988), and not only on the action of others and their adherence to the status quo; academic practices being just as prone to adhering to the status quo and their espoused theories as professional practices. Although I agree that it is a fruitful strategy to aim at generating descriptions and theories from the point of view of the practice under study I still think we should acknowledge and make clear our standpoints and \textit{a priori} assumptions and roles in the research project. Participating as a researcher in participatory design research projects entails more than being a facilitator of liberating change without any other agendas as early participatory design research sometimes seems to imply. We for example entered the intensive care unit with a technological agenda wanting to explore how day-to-day knowing could be supported by computing beyond the desktop.

Firstly, this changes the roles of the research and the practitioners. Rather than focusing on being a facilitator providing diagnosis and remedy a dialogue is emphasized where both designers and practitioners clearly state their subjective standpoint as argued by Gaver and Dunne (1999) and is in line with Wenger’s (Wenger in Binder 1996) idea that design could be seen as communities practice that challenge each other assumptions as above mentioned, rather than a one-way challenge. This opens up for the possibilities for also the researchers to reassess their own espoused theories and adherence to the status quo.

Secondly, it is important to acknowledge our partial understanding (Haraway 1991) of what the changes can mean especially in the long run and how difficult, for good and bad, it is to change in any substantial way current practices.

Thirdly, the complexity of liberation achieved through changed action needs to be more critically reflected upon than is discussed in the literature on action research and early participatory design research. There it is assumed that liberating effects, since grounded within practice and built from bottom up participation, will be liberating for the practitioners at large. Design research should instead be highly sensitive and aware of that any change will not necessarily be liberating for all, but rather liberating and constraining at the same time or more precisely more or less liberating and more or less constraining for different individuals and different communities of practice within the work practice under study as pointed out by Star (1991) in relations to standards and other technologies.
4.2 PARTICIPATORY DESIGN RESEARCH AND VALIDATION

Design research, with a focus on how things could be different or in alternative futures, has needed to develop its own way of reasoning concerning validation that differs from traditional science. But the statement “how things could be different”, points precisely towards that it is different to something else which is the present, which we know something about. In other words the future is not a historical vacuum, but springs out of the present. Validation is thus precisely about seeing what happens with the current socio-cultural condition if we try out alternatives or according to Ehn (1988) how the dialectics of tradition and transcendence play out.

Actions research aims, as stated earlier, at both proposing and hopefully achieving alternative constructive and liberating change of action as well as generate a theory of action. Participatory design research similarly aims at achieving alternative and hopefully liberating ways of acting in the world aided partly through new artifacts or more precisely through new socio-material circumstances within a particular organization or in relation to specific stakeholders. Participatory design research at the same time aims at generating new knowledge useful for other designers and design researchers on how human and nonhuman assemblages can be combined as well as how such questions can be explored.

The validity of the participatory design research results is therefore partly judged by how the involved stakeholders value the results. In our case our primary stakeholders have been the staff at the intensive care unit and the staff and patients at the hand surgery clinic. If they find the changes in the socio-material circumstances constructive and supportive of their work that validates the results as useful. If not, the results have little or no validity to the stakeholders involved. In both of the research projects the stakeholders have generally speaking been positive to the design outcomes, which as earlier stated have been tested and validated in the midst of their ongoing work, which gives added strength to the validity of the results. That the experiments have been conducted in the midst of work has in other words exposed their qualities and their potential weaknesses, which in turn has been central for the stakeholders when validating the quality of the results.

Krippendorff (2006) proposes that designers can validate semantic claims, or in other words what meaning is attached to what is designed through exploring multiple alternatives. Or more precisely the validity of the claims made by the designers can be evaluated by how well the designers have explored the different possibilities within the given design space and whether they have blatantly ignored or missed exploring certain alternatives. He states that “Examination of this kind of evidence must take into account various kinds of resources that the designer considered in
evaluating which design could move through their life cycles and at whose cost and benefits” (Krippendorff 2006, p. 266). The resources to consider for the designer, Krippendorff points out, are not only technological, rather the designer needs to evaluate the socio-material consequences of their design. In other words, validity in human-centered design is closely entangled to the politics of the stakeholders (Krippendorff 2006). Validity, according to Krippendorff, can thus be checked by examining the number of stakeholders or communities of stakeholders taken into consideration and how representative these stakeholders are, how incompatibilities between them were resolved, and who is favored in the choices made.

In both projects we have, particularly in the beginning of the projects, aimed at generating a rich picture of the practices designed for so that multiple design alternatives could be explored. Further, when starting out more design oriented exploration we have all the time been open for exploring different design alternatives. We have also taken into consideration what stakeholders are represented and how they have been affected, which also is accounted for in this thesis.

According to Krippendorff (2006), the commitment stakeholders’ show to the proposed design can also be accounted for as evidence of the validity of the design. In both research projects we have found that various stakeholders have been highly supportive of the design outcomes. At the intensive care unit the preliminary results from the participatory design process proved to be of such value that the head of the intensive care unit decided to prolong the project so that it could be anchored within the whole organization. Further, the unit was highly supportive in spreading the research outcome both within the hospital as well as to other hospitals within Sweden, which with varied result used the design outcomes to their benefit. Further, the research project was in the year 2004 awarded the Swedish User Award, where the users themselves nominate the project to a jury that through interviews and on site visits decide who should be given the award, and The Healthcare IT-ward arranged by the Swedish newspaper Dagens Medicine. Also, it could be added that the intensive care unit has continued several years after the research project, not only to use, but also to develop new ways of using self-produced video as part of their day-to-day work. The design research results have also traveled well to other domains, such as a pharmaceutical plant and an industrial packaging plant. Similarly, the staff and patients, involved in the hand surgery project, have been supportive and found the proposed design solutions meaningful. Some of the physiotherapists being so engaged that they have on their own continued giving patients individualized video recordings. One of the surgeons has been particularly supportive and shown interest in more permanently using the annotated X-rays in his communication with patients.
4.3 ETHNOGRAPHICALLY INSPIRED FIELD STUDIES

The practice of ethnography has extensively been used within design research. Ethnographic studies focuses on every day activities with the aim of describing these activities from the members’ point of view. In other words how the people under study make sense of the life world or events they are partaking in. Conducting an ethnographic study means observing how members of a particular culture, social groups, work practices or a group of people within a work practice and how they engage in their practical affairs. One of the reasons for observing the culture rather than just conducting interviews is that it can be difficult for the members to clearly point out and speak about their culture. A basic tenet within ethnography, as Blomberg et al (1993) points out, is that there is a difference between what people say, or in other word how they themselves account for their own behavior and what they actually do. Ethnographers aiming at accounting for members’ point of view mean that they build categories from within, rather than from a theoretical framework of predefined categories. Typically, ethnographic studies aim at holism, that is, how the “social system” under study functions as a whole, in contrast to simply studying individuals or specific tasks. The unit of analysis is thus on the interactions of people and activities and how they relate to the social system under study; be it a particular group within a work practice or the work practice as a whole.

When aiming at getting a holistic view of the work practice, or parts the particular group under study Blomberg et al (1993) points out ways that the field can be sampled. You can choose to focus on individuals, a specific group of people, places, events or artifacts. It is also important to pay attention to at what time the observations are done and that it is necessary to sample different time periods to complement the picture of the work being conducted. Working evening shifts being quite different for example from working day shifts. Further, in what way the ethnographer should engage in the culture being studied needs to be considered, which can be anything from ‘fly on the wall’ observations to participant observations. This said, ethnographers today are fully aware that even a ‘fly on the wall’ approach entails some form of participation and the presence affects those being observed and thus the ‘data’ collected. Further ethnographers are fully aware that participant observation does not mean that it is possible to fully see the world from the members’ point of view. None of the researchers being healthcare professionals it should go without saying that we have not been able to participate as full members, but rather have conducted participant observations.

When analyzing either group activities, specific events of technological use we have aimed at thick descriptions. Within anthropology and ethnography the no-
tion of thick descriptions was made famous by the anthropologist Clifford Geertz. As Crabtree et al (2002) point out: “Thick description stands in contrast to “thin description”, signifying the difference between mere behavioral accounts that describe only what can literally be seen and those characteristics which identify action as the practical action it recognizably is for members” (Crabtree et al 2002, p. 6) Mere behavioral accounts, as Geertz (1973), referring to the philosopher Gilbert Ryle (1971), do not suffice in and of themselves, but need to be thickened through contextualizing the action since the same literal behavior can mean many different things and is highly context dependent. The anthropologists’ task is precisely to contextualize the action, or in other words account for the practical and discursive situation the particular action is part of so that the action or practice is rendered meaningful to others. Crabtree et al citing Ryle exemplifies this by stating “[The] thinnest description of what the person is doing, e.g. penciling a line or dot on paper ... requires a thickening, often a multiple thickening, of a perfectly specific kind before it amounts to an account of what the person is trying to accomplish, e.g. design a new rigging for a yacht” (Crabtree et al 2002, p. 6).

There have been many proposals on how ethnography and the design of information technology can be combined. One way has been to engage ethnographers in the field studies of the context to be designed for to elicit requirements that are presented to the designers or to evaluate systems in use. Another has been to engage designers together with ethnographers in the field study itself (Blomberg 1993). There has been an increasing acknowledgement of the necessity to understand the context of use, but how ethnography and design could bridge is debated (Bannon 2000).

Being interaction designers, rather than ethnographers, we have conducted ethnographically inspired field studies to get a detailed understanding of the practices before engaging the practitioners in design experiments. However, an ethnographically inspired perspective has also been used when conducting the design experiments when we have aimed at understanding how the new technology might affect their practices. In this sense ethnographically inspired methods have been used during the initial studies of the work practices as well as when more design oriented explorations have been conducted.

The importance of conducting the initial ethnographic field studies needs to be emphasized. These field studies were first of all important in setting the stage; allowing both parties to get acquainted with each other on more neutral terms and gain insight into each others interests and intentions. Further, the field studies pointed out central aspects of the practices that needed to be taken into consideration when designing as well as pointing out qualities that possibly could be enhanced. At the intensive care unit for example our field study observations pointed
out the importance of an oral culture, learning as part of everyday activities, and
the use of contextual information. These aspects of the practice influenced what
type of design interventions could be interesting and possible to pursue. Similarly,
at the hand surgery clinic the field study revealed the importance of individualizing
the treatment processes, which was done through a collaborative articulation of the
patients’ concerns. At the same time I want to emphasis how the design interven-
tions have, at least in some instances, and at times revealed quicker and more richly
what conventions, practices, social framings were at play.

4.3.1 Video documentation

Video documentation has been extensively used in both projects as part of the field
study and for documenting the design experiments set up in the midst of work. Vid-
eo has been extensively used within ethnography at large and in particular within
workplace studies concerned with technology development and within studies of
technology in use (Jordan & Henderson 1994, Brun-Cotton & Wall 1995, Such-
man & Trigg 1991, Karasti 1999). The quality of video recording is that it to some
degree captures the action under study and through repeated viewing and analysis
reveals aspects of the interactions which would have else gone unnoticed (Jordan
& Henderson 1994) and can therefore temper and correct ordinary recollections
and intuitions concerning the situation being studied. This is especially true of col-
laborative activities which due to their complexity can be difficult to follow and
recollect. The analysis of video recording, as Suchman and Trigg (1991) point out,
focuses typically on the conversation between people, their use of artifacts as well
as gestures and body positions. Further, Suchman and Trigg point out that it is
highly useful to watch the video recordings together with the practitioners and do-
ning so that the practitioners watch is from the perspective of practice as well as from
the perspective of research where future alternative visions of work practice are
tried out.

Elaborate ways of transcribing the video recordings have been developed. How
much and in what detail the videos should be transcribed varies. Some argue that
all material should be transcribed while others only transcribe parts of the vid-
eo materials that is analyzed in detail. Henderson and Jordan (1991) suggest that
the transcription of the video material should be adjusted to the intentions of the
analysis. One advantage with transcribing video documentation and including it in
the analysis of the cases is that allows greater transparency, which make it easier
for others to judge the value of the analysis (Heritage 1984, Atkinson & Heritage
1984). The video transcription method used in the two design projects accounted
for here has been that of transcribing in detail on those parts of the video material that have been seen as relevant for detailed study. Other parts have most often only been given general descriptive labels.

Although we have been inspired by ethnographic methods the use of video has been closer to Buur, Binder and Brandt’s (Buur et al. 2000) use of video, who have used ethnographical inspired video recordings as design moves. Buur, Binder and Brandt argue that ethnographically inspired video recordings can be used as design moves similarly Schön’s notion of iterative drawing-seeing-and-drawing. In the first seeing the problem is framed, whereby what is seen is externalized and given structure. This structure can now be made to talk back and seen anew, which in turn can lead to a new drawing and new design moves. Video recordings of contextual inquiries are thus seen as anecdotes that frame the design problem and impose a temporary order on the complexity of everyday life and not as “hard facts.”

The course of action starts with the designers presenting themselves and their design interests and acquaint themselves with the work practice. Thereafter a person’s half- or whole work day is recorded where the designers ask questions concerning aspects that they find interesting, difficult to understand or unusual. By holding the camera the designers intention is made explicit and the one being recorded gets (to some degree) a picture of what aspects the designers pay attention to and thus what the project is about. The ones being recorded can explicitly observe what is being paid attention to and can react to that by directing how they act and chose to say in front of the camera. The video material is therefore co-authored and a result of a collaborative inquiry where certain tendencies, perspective, and intentions come forth. These recording are typically made into short chronological video portraits and are presented to those involved where it is explained that the videos portray the ordinary aspects rather than unusual aspects of their practice. Further, it is explained that the researcher are open for changing the material if it build on a misunderstanding of the material. Later the same persons are video recorded where they often take a more active stand by pointing out aspects of the work practice they want the designer to observe. The video material is then analyzed by softly and tentatively categorizing the clips into different themes.

4.3.2 Video documentation at the intensive care unit

Video documentation during the ethnographically inspired field study at the intensive care unit was not done. Instead we followed the nurses and nurses’ aides during their shifts; at times observing and at times inquiring into what they were doing.
The reason for not video documenting was that we were not comfortable with video recording their work with seriously ill patients. The three workshops held to discuss their work practice and possible future change were video recorded. The mock-up sessions where future scenarios were tried out were also recorded as well as the numerous experiments with making and using videos. The most important video recordings of the experiments were transcribed as well as categorized and compared. The categorization and analysis was partly done by the researchers themselves, but also to some degree together with the staff. The film review sessions were also video recorded, but mainly for the purpose of preserving the dialogue where parts of these sessions were transcribed.

4.3.3 Video documentation at the hand surgery clinic

Video documentation at the hand surgery clinic project was both used as part of the field study and as part of the design experiments. The first video documentation was a half-an-hour short walk through the different wards at the clinic where the nurses heading the patient ward and the outpatient ward guided us and shortly described the work conducted at the different wards. The second video documentations at the clinic were half-day recordings of work activities at the outpatient ward, the patient ward, the rehabilitation unit, and the operating theatre. The recording at the operation theatre focused on the interaction between the surgeons, anesthesiologist, and the operation nurse around the operation table. The documentation at the patient ward focused on the work of one nurse and showed how she constantly needed to reprioritize according to arising concerns when nursing the patients. The half-day video recording at the outpatient ward documented a nurse as she in collaboration with a surgeon consulted eleven patients. The video recording at the rehabilitation ward focused on individual physiotherapy rehabilitation sessions where the physiotherapist instructs the patients how to exercise their fingers and arms. These recordings were either made into chronological short films or into several shorter clips highlighting aspects of the ordinary day-to-day activities. These clips were then shown to staff participating in the recordings partly to verify that we, the researchers, had understood what they were doing and partly to communicate what aspects of their day-to-day activities we found interesting. The third video recordings made at the clinic were documentation of two patient treatment processes. The documentations, running a whole year, aimed at documenting how the patients experienced being treated at the clinic. These extensive recordings were made in
short videos and reviewed together with staff members and in one of the cases also
together with the patient.

Making the recordings has been invaluable help in gaining understanding of the
work conducted at the clinic and in gaining insight into the patients’ experience of
being treated. Many aspects of the everyday activities documented would have gone
unnoticed. Being able to repeatedly view the videos has also made it possible to
correct and temper first impressions and quickly drawn conclusions. Working with
video documentation within a healthcare setting, although highly valuable, has
been demanding; especially when documenting patients. Even partaking without a
camera in a consultation not only infringes upon the patients’ privacy, but can also
be stressing for the practitioners. Having these encounters video recorded infringes
even more on the confidential nature of these meetings and demands considerable
tact and feeling for the situations as they emerge. In most cases both patients and
healthcare professionals have been willing to be documented on video. However, in
some cases patients and staff have not wanted to participate and in other cases we
have felt that it had been inappropriate to start or continue video recording certain
events. Those who have been video recorded have been presented shortly to the pur-
pose of the recording and have been given a contract whereby they state to what de-
gree they allow that the video material can be used. In the contract it is stated that
they can at anytime re-evaluate their contract and withdraw the material. Video
documentation is also demanding because it is time consuming and labor intensive
method demanding detailed transcripts and repeated reviewing (Suchman & Trigg
4.4 CONSTRUCTING DATA IN THE ICU PROJECT

4.4.1 Field study

The ethnographically inspired field study at the intensive care unit was conducted between September and December 2000. Even though ethnography aims at holism, when conducting an ethnographically inspired study selections have to be made regarding what will be paid attention to; what the focus of attention will be. The focus of attention to begin with in the intensive care unit project was how informal learning played out in the day-to-day work at the intensive care unit. Our “informants,” were mainly the nurses, nurse’s aides and physiotherapists at the unit. The doctors were not part of our strategy of attention, which was unfortunate. Although our relations to the doctors developed later on in the project their perspective on day-to-day informal learning was missing. The observation of the nurses and nurse’s aides was a combined focus on an individual practitioner and specific patient rooms, since the nurses and nurse’s aides mainly were stationed in one and the same room during a shift. When following our informants we were both interested in observing how they would collaborate when treating the patients, but also how they used their physical surroundings as resources. We were also interested in observing competence development events and partook in a few more formal sessions, such as the introduction of a new medical technical equipment.

The initial impressions from our ethnographically inspired field study generated anecdotal fragments, which were later on structured into different categories that we considered significant and that were generative. The categories generated were:
The work environment is dynamic; constantly changing with large variation in the tempo, tactile cues are important, The staff distrust the technology, It is important with trustworthy sources, There is much information in the environment that competes for attention and the staff use a lot of contextual information, Discussions are frequent in the coffee room, It is important to create a picture of the patient, Colleagues are consulted foremost when a staff member does not know, The source of an alarm can be at the patient, the machine or between the two. Linked to each category were episodes and quotes encountered during our field study. Linked for example to the category Tactile cues are important and to the category Colleagues are consulted foremost when a staff member does not know were the following anecdote:

“It is not only technology that is used to watch over the patients. A nurse observes that the patient’s facial hue is darker than a few hours before. She continuously feels the patient’s hands and feet to check if they are colder or warmer.”

“The manual is extensive and I ask if he prefers to use the manual or consult colleagues. He answers that he finds the manual too cumbersome and prefers to ask a colleague if unsure.”

To de-familiarize ourselves and generate new questions and a new framing of the unit we applied skewed generative metaphors to the field material. Generative metaphors are metaphors, according to Schön (1978), which are used to see things in a new light. Schön for example points out how designers of brushes by viewing the brushes as pumps direct the focus of attention towards the space between the bristles and away from the bristles themselves. Seeing brushes as pumps allows them to see how the in-between spaces function as channels that pump the color. The strength of using such metaphors is that all the characteristics known from the chosen metaphor, for example a pump, can potentially be used on the domain it is being applied upon. Another quality with well chosen generative metaphors is that they can be used to understand and give words to a domain that you do not know well and you therefore have a limited vocabulary of. When using metaphors, according to Lakoff & Johnson (1980) it is important to be aware that metaphors not only foreground certain aspects, but also risk hiding important aspects of the phenomena applied upon, a risk we have tried to minimize by using several metaphors. Stating that we used skewed metaphors points at that we started using metaphors that were too closely related to the intensive care unit. Seeing the intensive care unit for example as a car repair shop, which was too closely related, was not generative.
However, the more skewed metaphors, which at first were difficult to apply, turned out to be more interesting. It worked well viewing the intensive care unit through such metaphors as politician, fisherman, construction worker, soccer player, farmer, a symphony orchestra, a court of law, restaurant, department store, and theater. From these domains in turn key terms were chosen. From the soccer domain for example the key terms chosen were team, team spirit, rules, referee, field, defensive, offensive, libero, winner, looser, tactical talk, play without the ball, training session, and match. Each domain generated large quantity of terms, but the concepts too closely correlating or too far from the unit was discarded and only those concepts that could generate interesting and meaningful question kept.

The different metaphors helped us ask new questions. The farming metaphor generated such questions as who plants seeds and who harvests knowledge at the unit, how long does it take before one can harvest, are there knowledge weeds, and is knowledge recycled? With the soccer metaphor questions generated were: Are there offensive and defensive activities and machines, when does one practice and when does one have matches, how does the play without a ball work? The department store metaphor generated questions such as: can anyone put up a sign at the unit, are there too many signs set up, and is there an information war going on at the unit? The politician metaphor helped us ask such questions as: are there populists at the unit, are there different parties at the clinic, can different parties create a coalition government, where is the podium? With the theater metaphor we asked the questions: is one allowed to applaud after a good performance, who is a prompter, what are considered small venues at the unit, and can the set design decide how the performance is experienced?

The aim of applying metaphors onto the field work data was to generate new insight and questions to broaden our design space. Working with several different metaphors helped to bring forth different issues, rather than working with one metaphor, which would have risked hiding many of the issues and questions brought forth. The questions generated were used when we going into a more active dialogue with the staff concerning issues of learning and knowing, sharing of information and what artifacts could be useful for learning and sharing experiences. These issues were addressed in two workshops where the staff played metaphor games constructed from the questions that had risen when applying the skewed metaphors on the data constructed.
4.4.2 Workshops on the social quality of technology and on learning & knowing

During the field study collaborative games were used to trigger reflection on issues concerning learning and knowing at the unit as well as the role of artifacts in sharing of meaning and where these artifacts would be typically located. The collaborative game workshops were an opportunity to gain insight into the staff’s perception and experience of their workplace culture, which would complement our study of how their work was conducted.

Two workshops were held with a varying group of five to six participants of nurses and nurse’s aides to discuss the relationship between knowing, artifacts, and work. The first workshop addressed such issues as what functions artifacts have in a social setting and how new artifacts are appropriated. The second workshop raised questions concerning learning and knowing at the intensive care unit. We constructed three games that were based on three metaphors.

The first workshop focused on what social qualities different artifacts have and how they are appropriated, which was played and discussed through the metaphor “The Intensive Care Unit as a family.” The game boards were a plan drawing of the intensive care unit and a plan drawing of a generic home. The pieces were small generic images of family members, (a mother, a father, a big brother, a younger brother, a big sister, a younger sister, a grandfather, a grandmother, a baby) and artifacts such as a newspaper, treasure cabinet, telephone, cake, megaphone, bulletin board, television, computer, video player, washing machine, remote control, whiteboard, stereo, tent, calendar, iron, and a digital pet). The last group was a set of attribute pieces (such as alone, female, male, and unisex).
The rule of the game was that the players first had to place the family members and thereafter place, as a group, one artifact at the time; starting with the most important artifact. For each artifact they placed they had to motivate the chosen location and state what social consequences placing the artifact there would have.

During the first round the first artifact placed in the home was a newspaper, which was placed in the kitchen. It was an important artifact because it sustained tradition and engendered discussion. During the second round, when placing the pieces on the ICU game board, there was no single artifact that clearly had the same function as the newspaper in the home. The players suggested that both the computer and the bulletin board as equal alternatives to the newspaper, although neither artifact assembled people or engendered discussions. Ultimately the newspaper was placed in the cafeteria representing the daily information folder motivated by the fact that it often was a point of reference when discussing and a valuable resource for sustaining tradition. They further stated that daily information folder needed a megaphone so that knowledge from it could better spread; in particular knowledge from Else-Maj, the head of the unit and represented on the board as a grandmother, who had a central function in spreading knowledge and wisdom.

Most of the time during the game they were free to choose which artifact they wanted to introduce and in what order, but we interfered three times giving them artifacts they were not asking for. When we introduced the video camera and asked how it could be used and who would use it the answer was immediate. It can be used for documentation and it is Sue who will use it. Sue is a specialist nurse in charge of coordinating the professional development of the specialist nurses and nurses’ aides. She had recently introduced a digital camera and a video camera into the intensive care unit. The video camera at this time had mainly been used by her for documenting different work practices such as what happens when a patient arrives to the unit. It had also been used for documenting case seminars. Soon after the first video camera was presented into the game we presented a second video camera on the game board with the conviction that a video camera is a useful tool for a lot of purposes in most settings. To the workshop group it was unclear for who it would be useful for.

When the players placed the computer on the board it resulted in intense debate about where it should be placed. In the end the computer was placed in the administration area of the intensive care unit with the claim that its most important use was for administrative tasks. It was stated that formerly it was the administration in a company that first got computers. Apparently that view was still prevalent among the workshop members. Perhaps their view of the computer as an administrative tool partly also was derived from the fact that it is mainly used by the staff to regis-
ter patient information in the electronic patient journal system. One of the players stated that a computer could be used for any purpose. But the other players had a difficult time seeing the computer as something else than an administrative tool. It also became apparent that the staff made a clear distinction between the computerized medical equipment and the stationary computer. It surprised us that they were greatly critical of the stationary computer because they were used to and highly competent at using advanced medical technical equipment, which is highly computerized. As far as we had seen they were not apprehensive of technical equipment.

During the second workshop the metaphors “The Intensive Care Unit as garden” and “The Intensive Care Unit as Production Company” were used to discuss how knowledge is cultivated and taken care of and what it means to partake in projects and construct and produce knowledge at the unit. The game pieces for the garden metaphor consisted of intensive care unit staff (in the form of experienced and less experienced doctors, nurses, and nurses aides, as well as relatives). Other pieces were vegetation of different sizes (such as flowers, shrubs, and trees). Several pieces depicted different stages of cultivation (such as seeds, sprouts and plants, etc). Lastly, there was a set of images depicting a variety of gardening tools (such as sprinklers, shovels, and weed-killers). The game pieces for the production company metaphor also consisted of medical profession working at the unit as well as other professions (such as salesmen, researchers, DJ’s, authors, journalists, archeologists, coordinators, detectives, scouts, and project leaders), various forms of knowledge (such as artistry, bookish knowledge, critical knowledge, and reflective knowledge), and artifacts (such as encyclopedias, magazines, cookbooks, and so forth).

Playing the garden metaphor and the production company metaphor pointed out that the staff felt that the intensive care unit had to some degree a communication problem. Knowledge generated at the unit did not spread well enough both formally and informally. The ongoing projects were not visible enough and the daily learning that happens in the patient rooms did not spread. The patient rooms, as one of the participants stated, were greenhouses where knowledge was cultivated, but were regrettably enclosed greenhouses. Previously the cafeteria was a place where knowledge was spread but this was not the case anymore; the cafeteria being less populated than in the past. One participant suggested that perhaps ongoing projects could be made more visible by advertising them on the unit’s television in for example the coffee room.

The second insight from playing the garden and production company metaphors was that the staff enjoyed and considered themselves good at producing knowledge, but that they found transforming the knowledge developed into written form demanding. They stated that it was the unit’s policy that everybody had the oppor-
tunity to saw a seed that might bloom into a full-fledged project and that the unit encouraged the staff to partake in competence development projects. They considered themselves quite good at producing knowledge and listed several projects that had been running such as the nutrition project and the wound treatment project. A problem with the internal projects, on the other hand, was that it was demanding to author the results; be it guidelines, instructions or reports. It was easier to share the results orally than in written form. They unit would be much helped by having an author. Another problem was that there was little information about the projects until they had ended. Although the staff was proud of the projects and found them important it became clear that they were to some degree a burden. There was too much information at the unit; too much knowledge produced, which resulted in that the projects easily became a burden.

4.4.3 Early design explorations

Between January and May 2002 two lines of inquiry were explored based upon insights from the field study. One line was the possibility of having contextualized information available on small displays closely connected to the ongoing work. The other line was the making and sharing of self-produced videos to engender shared meaning making.

The first line of inquiry came up as a possible area to explore during a workshop on future use of technology, which focused on technology that could support meaning making closely integrated into the day-to-day work. The workshop participants, consisting of two nurses and a nurse’s aide, were presented with small mobile input and out devices and tag technology, which we imagined, could best become part of the day-to-day work activities. The workshop participants found tagging information in their workplace, which could be retrieved with small displays, most meaningful for supporting learning and knowing as part of their day-to-day work. To deepen our understanding of how small displays and tagged information could be of value two staff members were asked to carry displays and tags during a shift and show where and when they imagined the technology could be used. The staged
enactments pointed out that the technology could perhaps be used pervasively for all kinds of activities, but that it more likely would be useful for retrieving seldom needed information relating to activities infrequently performed.

Concurrently we explored if collaborative meaning making could be supported by self-produced videos, which could be shown in the unit’s coffee room. Could in other words short movies produced by them make issues, project results and so forth more visible and engender discussions? The staff was presented with the possibility to easily access their own videos in the coffee room through video barcode cards, which would activate the chosen movie on the coffee room TV-set. Presented with the staged functionality of the idea the staff stated that they found self-produced videos to be an interesting idea, but that it would be better if they were made available in the patient rooms.

The initial design experiment phase ended by deciding to combine the notion of contextual information retrieved on small displays with self-produced videos. The researchers’ focus of attention therefore turned to how the videos could be produced and used within different locations at the clinic and how it affected collaboration. Further, our focus of attention turned to in what way these videos could be made physically present in the work environment.

4.4.4 Pilot study on the producing and using of mobile videos

A pilot study exploring how to make videos, how the content should be shaped and how the videos could be used was mainly conducted between August and December 2001. The making, reviewing and using of the video were concurrently and iteratively running and influenced each other. Forty-three videos were made covering twenty-six topics; (some of the films were made several times for the staff to practice and some needed to be re-recorded). Most of the videos concerned medical technical equipment, but a few movies on nursing procedures were also made such as how to change the central venous catheter, the cleaning and dressing of a fasciotomy. Fourteen nurses, five nurse’s aides, a physiotherapist, a doctor, and salesman of medical technical equipment were involved in making the videos.

During the first sessions we filmed the staff, but after four weeks of recording and twenty-four videos the staff took over the recording, which improved the quality of the videos. The staff being well acquainted with the moments filmed, while we did not know in detail what was being shown and told, which made it difficult for us to follow the movements of the person being recorded and when to pause. Also, the dialogue preceding a recording became more insightful.
To begin with we needed to explore how the recording could be simplified and if they could be made without preparation. The result showed that the videos could be made without a script and produced by cutting the film in the camera; pausing the recording when one sequence is done or when something went wrong during the recording. It also turned out that the recording worked best by letting the “actor” follow their preferred chronology rather than instructing them in what order and how they should show the moments since the one being filmed has often a preferred chronology. This made it possible to have an almost finished video when the recording session ended where only a few scrap frames in the beginning and the end of the movie needed to be removed. The experiments resulted also in simple thumb rules, which were taught and made available later on as a tutorial on the project’s computer.

Simultaneously we explored how the content of the video should be shaped. Six film review sessions were held at the intensive care library where a varying group of four to seven nurses and nurse’s aides participated. Questions that needed to be answered were for example how complete and detailed the instructions should be. In other words what level of competences and prior knowledge should be taken for granted? Does it suffice to show and tell how the moments are performed or should they be complemented with explanations why it should be done in a certain manner. How much should the individual personality and ways of performing be allowed to shine through; or should all the videos have the same pace and tone? How important is correct naming; do for example the machine parts need to be named with their “right” name or is it sufficient that the parts are clearly depicted and how they are handled? What terminology should be used; can they say “the tube” or should the actor instead say “the tracheal tube”? How authentic do the videos need to be; can some moments be filmed on dolls or should patients be used?
The staff agreed that it is important not to be too unspecific with the naming to sound trustworthy. On the other hand, the films should not contain strange words that are not part of the unit’s daily terminology. It was also agreed that the videos should be geared towards experienced staff and that showing or explaining basic moments could be skipped. Further, it was agreed that filming as authentic situations as possible was preferable. Filming for example the fixation of oral tubes on patients rather than dolls, which shows problems that arise in the real situation was considered to be more useful even though the video recording of the doll was in some ways clearer.

Seven test sessions were set up at the unit where the usage of the videos was explored; ranging from tests disconnected from the ordinary flow of work to sessions in the patient rooms in the midst of ordinary work. Later tests showed that using the videos was a collaborative activity, which we had not expected.

One formal film review session was arranged to quality assure the videos where the senior physician, partaking for the first time, and the nurse in charge of the medical technical equipment, the nurse in charge of competence development participated prior to launching the videos at the unit for anybody to use.

During 2002 fourteen videos were made by twelve nurses and nurse’s aides, (where some of the videos were retakes on earlier films or amendments made to previous videos). From the start we had been interested in exploring more temporary use of video, which we termed video letters, but without success. During 2002 two such videos were made by the nurses on their own. The first video was spontaneously made by one of the nurses on how to run a child dialysis aperture, which had been assembled and configured specifically for that treatment. The video was used in communicating with the coming shifts how to handle the equipment. The second

Figure 20: Probing further into the making and using of self-produced media
video letter was a recording of a dressing of an open abdomen, which the doctor from another clinic as well as other shifts could watch. Towards the end of the project we also got the opportunity to shortly explore the possibility of documenting work procedures from another clinic relevant for the staff at the intensive care unit. One of the nurses from the post-operation unit filmed part of a hernia operation that she considered important for the nurse and nurse’s aides to have insight into.

The projects stationary computer was installed late February 2002. The computer was used to capture, edit, compress, produce barcodes and synchronize the videos with the handheld computers. A simple interface, made in PowerPoint, was made for organizing and keeping track of where in the production process the videos were. The interface was divided into four categories, which were: Reviewed videos, Raw videos (videos that need to be reviewed or redone), Film cookbook, and Continuous Learning within Healthcare presenting the project and summaries from the project workshops.

January 2002 we started exploring in more detail how the video links could be placed out in the work environment as well as developing the barcode reader application running on the handheld computers. What we wanted to explore was what role the barcodes would play in making the videos more accessible and if they would disturb other elements in the work environment. In the middle of April the exploring of how the video barcodes could be placed out in the environment was finished resulting in mobile plastic coded video barcodes collected in plastic folders at strategic places at the unit.

Three handheld computers, two with barcode readers, were placed out in the unit at the beginning of March. The launching of the handheld computers was delayed due to a bug in them; half of the video would not show in full screen view, but was solved after a few weeks when the software was updated.

4.4.5 Organizational anchoring

The last phase of the project, running throughout 2002, focused on anchoring the project amongst the 140 staff members and within the unit’s organizational structure. Three full day workshops were arranged, each workshop engaging 30 – 35 participants. Around 100 of the 140 staff members got hands-on experience with making videos, use the handheld computers and discuss how the project could be integrated into the organization. (In conjunction with the workshops the equipment was also introduced at the unit for those unable to attend).
The first part of the workshop focused on making and reviewing videos. The staff started with familiarizing themselves with the video camera and how it feels to be filmed. In pairs they made a one minute video of each other; a presentation of themselves followed by a positive anecdote from work. The next exercise consisted of making videos, in groups of six, about prone positioning, heart lung resuscitation (HLR), and a normal day at the post-operation unit based on scripts written by a nurse and a nurse’s aide. Each group made two versions of a given topic where the group members both filmed and acted as patients, relatives, doctors, nurses, nurse’s aides, physiotherapists and social worker. After reviewing the first recording a second version was recorded where a “best practice” video showing how the activity ideally could be performed.

The staff was also introduced to the handheld computers and how they could start the films with the barcode reader. A digital quiz walk had been set up where the participants followed a given path with halts where barcodes linking to video filmed question had been placed. The videos consisted of short videos where the head of the department dressed in various costumes asked clever questions.

The third item at the workshop was discussing in small groups what was needed to create a positive learning process and what stages that are needed to produce the videos. The discussion pointed out that it was important that everyone had the possibility to suggest topics to be filmed and have the opportunity to make movies. At
the same time it was considered necessary to establish a film group that other staff members could turn to for assistance and a film review group that quality assured the videos.

The initial aim of making the movies was to give the staff hands-on experience of making and reviewing movies. An unexpected secondary outcome was that the recording of the scenarios generated valuable enactments and discussions that the unit felt needed to be looked further into. A HLR seminar was arranged where clips from the HLR-films and comments made on the films were presented, which in turn helped to formulate a new routine around HLR. Similarly, a prone positioning seminar was arranged, which not only lead to a new routine being developed, but also to the first film made across professional boundaries; involving nurses, nurse’s aides and doctors in developing a new prone positioning routine.

A film group was established to explore the production process with us, and discuss suitable programs. The nurse in charge of the unit considered it important that the film group consisted of dayshift and nightshift staff as well as people from the post-operation ward respectively the intensive care ward of the unit. Four staff members were given lessons in how the video camera works, how the recording is done, capturing and editing of the video, compressing and transferring the videos to the handheld computers and making the video barcode cards. For the most part they found the production process unproblematic.

During 2002 the informal film reviews of the videos were taken over by more formal arrangements of the film reviews. Two formal film reviews were arranged that year to quality assure the videos before publishing them at the unit. The film review group grew out of the informal film reviews that were arranged to get feedback on the content of the movies initially being made. The formal film review group established consisted of, besides those making the films, the senior physician,
the nurse in charge of the medical technical equipment, and the nurse in charge of
the clinic’s competence development.

4.5 CONSTRUCTING DATA IN THE HAND SURGERY PROJECT

4.5.1 Early pictures of the hand surgery clinic

During the spring of 2003 two workshops were arranged at the School of Arts and Communication that aimed at getting a picture of the hand surgery clinic and to discuss what design experiments could be pursued the coming autumn. Participating in the workshop were representatives from the involved IT companies, staff from the hand surgery clinic, and the researchers. For the first workshop the clinic had been asked to prepare a general presentation of the clinic as well as a scenario of the course of a patient’s treatment.

At the first workshop the hand surgery staff traced a trauma patient’s treatment course, which had taken more than a year and involved all professions working at the clinic. The presentation pointed out three recurring problems facing the staff at the hand surgery clinic. First, that the patients often feel insecure when moving from one ward to another, when returning to their homes, and when treated by their municipal healthcare centre. Second, that it is difficult to communicate to patients with severe injuries what a long and complicated course of events awaits them. Third, that the patients are only receptive to small portion of what is communicated.

During the second workshop the issues of continuity and sense of security and the difficulty of giving patients a picture of the forthcoming treatment were addressed more fully. Regarding continuity and sense of security the staff pointed out that although an operation can from a technical perspective be successful the following process can be a roller coaster ride through the clinic. The clinic tries to create continuity for example by letting patients from the patient ward visit the rehabilitation ward to meet with patients and the rehabilitation staff. The transition from the patient ward to the outpatient ward on the other hand is in some cases problematic. Patients with more complicated injuries and large bandages come for the first time to the outpatient ward after having been emitted from the patient ward where the outpatient nurses have little insight into the scope of the injury or how well the patient is coping. Working towards continuity and a giving the patients a sense of security, although not always optimal, is central aspect of the clinics work and an issue that is always on the agenda.
The hand surgery staff also pointed out that the clinic would want to give patients and relatives a better picture of the treatment process. Trauma patients, often being in shock, are not capable of thinking about long-term consequences of the injury. Elective patients on the other hand, that make up half of the clinic’s patient population, would value if they had a better picture of the treatment process. They often do not know how well they will recover and how the injury will affect their professional and private life. Giving a good picture, it was emphasized, means showing the patient that they can lead a good life despite the injury, rather than false expectation. The hand surgery clinic could gain a lot if the patients were better prepared and knew more about what to expect when returning home. Many patients call the clinic about basic problems concerning their injury. Further, it was pointed out that relatives also need information of the future course of actions and are more receptive during early stages of the treatment, but are at times set a side.

The scenario and the discussion at both workshops pointed out that it might be fruitful to make more visible, with the aid of video recordings, the course of the patient treatment, strengthen the communication between staff members as well as between staff members and patients. It was therefore suggested that trauma patient receptions would be recorded for the purpose of improving work routines. Also, that the possibility to send video letters between the wards at the clinic could be explored; for example if filming the last bandaging at the patient ward could be recorded and handed over to the outpatient ward. Furthermore, the possibility to
record individualized patient instructions could be explored. At last, if the clinic’s brochures, of the most common surgical treatments, could be complemented with multimedia material on the clinic’s homepage showing how to care for the injury and how other patients have managed.

Most of the suggestions involved the recording of videos for temporary usage rather than best-practice videos that could be used over a longer period of time. This raised new questions, not addressed at the ICU, concerning how the videos should be produced, stored, and retrieved. Whether it would be worth filming individual patients or situations and if so who would do the filming? Whether wall mounted cameras could be used? How the patients would access the video material at home and would the videos need to be made available in different formats? Whether the patients could handle the equipment with an injured active hand? Whether the patients could be tagged and the recordings automatically connected to other patient data or the patient’s personal webpage?

At the second workshop it was decided that the researchers should film two patients through the whole treatment process. One of the cases should be a trauma case and the other an elective treatment involving a child. The purpose with video recording the patients was to gain better understanding of how the patients experience the treatment process and also to see if such video material could be used to make the treatment process more understandable to other patients.

### 4.5.2 Video documentation of two patients

During early autumn of 2003 the documentation of two patient treatments began and continued until early autumn of 2004. As decided, one patient was a child going through a smaller elective surgery and the second patient was a severe trauma case. Both patient were in other words filmed from the time they entered the clinic, when going through surgery, when being treated at the patient ward and subsequently visiting the rehabilitation ward and the outpatient ward. These extensive recordings were subsequently made into short films, which then were shown to the staff. In one of the cases the patient and the patient’s mother partook in the review. Regarding the trauma case the staff considered it too early in the treatment process for the patient to be confronted with the recording. Insights gained from these recordings are to some degree accounted for in chapter two.
On October 8, 2003 a third workshop was arranged to develop scenarios by combining technical possibilities with previously identified areas that could be interesting to explore. The workshop participants were presented with technological components that could support the production, editing and usage of self-produced media and how with newer technologies the three phases have in some ways merged.

The production and input technologies that the participants were presented with was Anoto technology, which is a digital pen with a camera that can capture marks made on digital paper which is sent and stored in a computer, and digital video recorded onto hard drives or memory sticks. Alternative ways of categorizing the produced digital material was presented. It was for example suggested that categorizing who should have access to a video recording could be done by physically placing the camera in a sorting basket or by linking the video to documents printed on digital paper. Ideas on access technologies presented were different types of tag technology such as RFid tags, barcodes, and Anoto paper as well as different types of storage media. Display technologies presented were mobile computer displays, handheld devices, and tablet PC’s.

The first scenario developed concerned video documentation between the wards at the clinic. It was suggested that for example the handing over of complex re-bandaging from the patient ward to the outpatient ward, which could create a stronger sense of continuity and sense of security. The recording would either be cut in the camera or marked on the fly so as to highlight relevant segments. For the outpatient staff the maximum length that the video could be was judged to be five minutes. Ideally the video would be sent down to the outpatient ward by linking it to the nurse-bandaging note, which is a short note explaining what needs to be bandaged. This could be done through having the nurse-bandaging printed on Anoto paper. By drawing a play knob on the note the most current video in the video camera would play.

Figure 24: Representatives from the participating IT-companies, handsurgery staff and researcher develop scenarios around self-produced media.
would be linked to the note. In turn the video could be played by taking the note to a computer and with an Anoto pen press on the drawn play knob.

The second scenario developed concerned the possibility of patients sharing experience and practical tips. The ethnographically inspired field study of the rehabilitation unit had pointed out that patient share practical tips as well as thoughts on how their life has changed due to the injury. It was suggested that patients could document how they handle practical situation, for example in the kitchen at the rehabilitation ward, which would be made accessible at the clinic for other patients to watch.

The third scenario developed concerned the making of training material. The question was if they should be general or individualized training instructions. It was decided that if explored, individualized training instructions would be a more interesting and viable line of inquiry. The staff stated that if the clinic were to offer their patients individualized video instructions that only certain patient categories would need them. Perhaps the content of the video could have a predefined, yet somewhat flexible structure. The content could be divided into chapters on-the-fly by marking the material with a pedal. Similarly re-recording a chapter could be controlled with a pedal, making the recording, loading and production happen all at once with little or no post-production.

The fourth scenario concerned multimedia content that could give patient a better insight into the forthcoming treatment process. Could patients be helped by having parts of an early consultation recorded, before beginning on a treatment course, as reminders of how the treatment course will proceed? Could a future Anoto pen with a microphone and speaker be used for such purposes? The surgeon could draw on an Anoto paper preprinted with a hand, blood vessels, and skeleton and circle the injuries the patient has and what it can mean in terms of treatment and expected recovery. The surgeon’s explanations could simultaneously be recorded and linked to marks made on the paper by the surgeon. At home the patient could play the sound by pointing with the pen at the marks made on the Anoto paper.

4.5.4 Experiments with making individual physiotherapy training instructions videos

Several times during the first phase of the project it had been suggested that it might be fruitful to explore giving patients video recordings of their physiotherapy visit. It was therefore decided to film, during October and November 2003, three physiotherapy training sessions. The aim with the experiments was to see if the patients would find them useful, if general or individualized videos were to be preferred,
how long the videos could be without becoming tedious, if they needed to be divided into chapters to allow for easier navigation, and if the recording could be done with a stationary camera.

The recording was done with a DVD-camera, (with an internal DVD-burner), mounted on a tripod, which was placed a few meters away from the small mobile table where the session happened. Three patients, all with a similar tendon injury, were given personal video instructions. The length of the videos clocked around fifteen minutes. Two patients were given CD-ROM’s while one patient was given a Tablet PC with the video placed on the desktop for easy access.

The patients found the idea novel and were willing to partake in the experiments, but were skeptical that they would find the videos useful. Interviewing the patients some days later they all stated that they had watched the fifteen minute long video several times and as such had found it highly useful aid when doing their exercises. Two of the patients had also used their video to communicate about the injury to their relatives. One of the patients also used the video to compare how he had progressed in his treatment. As such, individualized video documentation and instructions seemed promising. The patients had navigated with ease in the movies by using the timeline in the media player and dividing the video into chapters proved unnecessary.

The experiments also showed that the video production could be done without complicated editing during or after the recording. What we did not know, however, was if the recording of the video could be integrated into the ordinary flow of work or needed to be made even easier and quicker to produce; the burning of the videos taking several minutes. We also did not know what other patient categories might be relevant and whether it could be of value to successively add new content as the patient treatment progressed.

### 4.5.5 Individualized video documentation of doctor’s consultations at the outpatient ward

During February 2005 an experiment was set up at the outpatient ward to study the usefulness of giving patients video recordings of early doctor visits. Patients with
rheumatism, degenerative joint disease causing worn out cartilage in the joints of their hands, and so on, come to the clinic to have their ailment or injury diagnosed and treated. Such diagnoses need to be weighed where the pros and cons of possible course of action is taken into consideration. Injuries of the thumb base and Dupuytrens contractures in the hand are common diagnoses where the course of action is not given in advance. Surgery in the later case can increase the contractures. A risk the patient needs to take into consideration before going through an eventual treatment, but remembering the pros and cons can be difficult. Could it be valuable for the patient to bring home such documentation on video to be reminded of what the doctor has said when considering the proposed options?

The consultation, lasting about fifteen minutes, was recorded on a DV-camera and given to the patient on a VHS-cassette. The doctor having a good picture of the patient physiological and social situation assessed the injury and explained the pros and cons of operating respective refraining from the treatment. Thereafter giving his recommendation and suggesting she consider the options and recommendations and return a few weeks later.

The patient thought it was highly valuable to have the visit documented giving her the opportunity to watch it at home in peace and quiet and show it to relatives to discuss what to do. She even stated that every patient should be given such documentation. Even though the experiment showed that it was valuable for patients to receive individualized videos from early consultation, we did not know at this time if the making of the videos would be too demanding and time consuming for the surgeons.

4.5.6 Workshop on individualized patient videos

On March 4, 2004 a workshop was arranged where the experiments on individualized video instructions were presented. The aim of the workshop was to discuss what type of patients should be given individualized videos, what further experiments could be set up and how the videos should be distributed. Participating in the workshop were representatives from the hand surgery clinic and project participants from the IT-companies and the researchers.

Regarding what parameters should apply concerning who should be given videos turned out to be difficult to determine. However, the clinic receives six thousand unique patients per year and it is neither relevant nor viable that all patients should be given video instructions. One way of prioritizing could be to give only patients with complex injuries and insecure patients individualized videos. Whatever parameters for prioritizing would be set up presumably the videos would be
most relevant during early phases of the treatment. The participants agreed that more experiments needed to be done to see which patients should be given videos and whether it might be worthwhile combining general and pre-produced material with individualized video recordings.

On the subject of what further experiments could be conducted it was suggested that we could look into alternative ways of documenting early consultations at the outpatient ward. The surgeons, using Anoto technology, could for example draw on a pre-printed hand while verbally summing up the diagnosis and possible course of treatment where the verbal summary is linked to the drawing. The patient could thereafter play the narrated animation on the home computer. It was suggested that it might be interesting to look into if video instructions also could be used to facilitate patients starting to dress and bandage their wounds at home.

On the topic of who should administer and distribute the videos it was pointed out that the production and distribution of them needed to be simple. The question was raised whether the clinic could produce the videos with existing technology or if it would be better that an IT company stood for the distribution. In the first case, the distribution would need to be limited to one format and a simple manageable technology. In the second case, a media database would be needed where the videos would be stored.

### 4.5.7 Film review of individualized outpatient consultation videos

A film review at the hand surgery clinic was arranged on March 9 2004 to discuss the individualized consultation videos and what other experiments should be done at the outpatient ward. Participating in the film review was one surgeon and two nurses. We watched the fifteen minute long video that had been given to the patient where the surgeon presents the pros and cons of going through an operation of the thumb base and where the doctor ends up advising against operating, but gives the patient the possibility to think through the decision at home.

The surgeon was pleased to hear that the patient had found the video highly valuable, but pointed out that perhaps less intrusive ways of recording could be explored. At first the possibility of drawing on Anoto paper and linking what the surgeon says to the drawing was discussed. The idea was considered having potential, but the surgeon suggested that it would perhaps be even better if he could draw directly on the digital X-ray. The X-ray has the advantage of having the right proportions, shows the essential parts of the hand, and is an image of the patient’s own
hand. We therefore decided to explore the possibility of making X-ray animation with the surgeons oral explanation connected to the patients individual X-rays.

4.5.8 Film review with the physiotherapists on individualized patient instructions

During the month of June 2004 a film review was arranged with the physiotherapists to watch the videos they had made and discuss how the making of them affected their work. The second aim of the film review was to see if such session could support the sharing of experience between the physiotherapists.

The physiotherapists stated that giving patients individualized recordings had largely positive effects and the recording did not to any large extent alter their current ways of working. They further pointed out that video recording the first session opens up for the possibility of including more information during that visit without risking that the patient misses any of it.

The review session also showed that watching individualized patient videos could potentially be valuable to gain insight into each other ways of work leading to improved ways of treating the patients. It also engendered a discussion concerning their use of language during rehabilitation sessions.

4.5.9 Experiments with wound dressing video instruction

During September 2004 an experiment was set up at the outpatient ward to see if video instructions could support patients involved in bandaging their own less severe injuries at home, which could be particularly interesting for patients living far away from the clinic. The nurses at the outpatient ward had pointed out that some patients could start redressing their injury, but even though the worst pain has subsided and they have several times seen how the dressing and bandaging is performed feel insecure and hesitant when asked to consider the option. We therefore wanted to see if patients would be less hesitant if given a video.

A patient that had cut the tip of the finger in a work related accident and was being treated with Steri-strip was willing to partake in the experiment. Together with a nurse we filmed with a video camera with an internal DVD-burner when she dressed and bandaged the patient. The dressing and bandaging was done at the consultation table in one of the consultation rooms. The recording, done by one of the researchers standing close by the table, was a close-up shot of the hands. The
The patient was visited in his home to study how he used the video. The patient found the video highly useful and made him feel secure.

4.5.10 Experiments with x-ray movies

During November and December 2004 experiments were set up at the outpatient ward to explore if patients would find it useful to receive concentrated recordings of early consultations. Patients were given summaries of the consultations where the surgeon draws on the patients’ X-rays and summarizes the diagnosis. The question addressed was first of all if general movies would suffice or if it was preferable with individualized films? Secondly, could making the recordings be integrated into the already hectic and tightly scheduled work at the outpatient ward?

The experiments pointed out that individualized X-ray films rather than general movies were preferable. Five of the patients’ given films belonging to the same patient category needed to be treated quite differently. The patients found the recordings useful reminders of the doctor’s visits and a valuable support when talking to others about their injury and when consulting with relatives and friends whether they should pursue a suggested treatment. The recording of the X-rays, which was controlled with two buttons on the keyboard, turned out to be easily integrated into the doctors’ workflow. Producing and burning the movies on the other hand turned out to be more difficult to integrate.

4.5.11 Review of x-ray experiments

During spring 2005 an x-ray review session was arranged at the clinic. The purpose was to present the movies, the patients’ responses and discuss with the surgeons and nurses and nurse’s aides how making the X-ray films affected their workflow. Participating in the review session were the two doctors that had made X-ray mov-
ies, the heads of the outpatient ward and the ward and the nurse’s aide that had
partaken in the experiments.

The surgeons did not find that the recording of the movies disturbed their work-
flow and delimiting the recording to a concentrated period more viable than re-
cording the whole visit. Although both surgeons were positive one of the surgeons
pointed out that giving the patient recorded material can be delicate. Delicate be-
cause the surgeon has made promises, which later on might turn out to be difficult
to keep and because it can be difficult to know how the patient will use the material.
Further, he pointed out that making recording in the consultation room risks cap-
turing patient information pertaining to other patients.

4.5.12 Physiotherapists making videos on their own

During the fall of 2004 the physiotherapist continued to give patients individual-
ized videos, but with a decrease in the “production.” The reason for the decrease
was that the time margins are tight and it is difficult to dedicate a few extra minutes
to the finalizing of the videos and especially if the patients are delayed from the
outpatient ward. The decrease was also partly due to that the camera was inacces-
sibly placed and not readily available, which pointed out that a more simple form of
production would need to be developed.
4.6 INTERPRETING THE DATA CONSTRUCTED

Writing this thesis has meant translating the data constructed through the debate on space and place within interaction design, but also through debates carried on within other disciplines. Regarding the later, this has meant that connecting the design research interventions to debates going on within the field of interaction design, but also within other fields such as science and technology studies, feminist epistemology, anthropology, sociology, philosophy, and science and technology studies. The process of interpreting the data constructed and connecting it to theoretical debates is one of recursive translations. The data is transformed when certain perspectives, concepts or notions are adopted and applied. This has not meant forcing static concepts to static data. Both the data constructed and the concepts or notions used are not closed, but rather open for interpretation. Concepts and notions such as communities of practice, reification in participation, social framing, connected realities, inscriptions, convergence without closure, and so forth have been used to interpret the constructed data. My hope is that making these connections and these articulations has generated and contributed to new knowledge. At times making the connections has not been an easy task. The constructed data and the concepts used have at times seemed like an ill fit. On a more positive note, making the connections between the constructed data and the concepts used has been one of fruitful challenge, where the concepts used have shed light on the data and the data has in turn exposed the qualities and problems certain concepts, terms and notions carry with them.

Krippendorff (2006) argues that the design disciplines should be seen as disciplines that are fundamentally different from other disciplines or sciences. The design disciplines need therefore to develop on their own a set of terms and concepts, rather than borrow concepts and terminologies from other sciences. Although I agree with Krippendorff that the design disciplines can very well come up with their own set of concepts and so forth I am reluctant to see design as a neatly circumscribed domain. Just as science and technology or the domain of engineering are heterogeneous, a mixtures of technology, sociology, economics and so forth, so is design a heterogeneous activity. Seen from another angle I cannot see what the design disciplines have to win by viewing themselves as distinct. Design is a deeply cultural activity, and cultures as I have earlier argued connect and are extroverted rather than enclosed and hermetic. Designers have thus much to win by connecting to and borrowing from other disciplines and sciences. What connections need to be made depends partly on the concerns that arise in the project, but also depends partly on what the discourse you belong to demands. Further the discourse that you belong to, with its specific agendas, ways of arguing, demands that you connect,
argue in certain ways. This does not mean that there is no freedom to bend the rules of the discourse, but just that they cannot be bent arbitrarily.

4.7 SUMMARY

In summary, I have located the research approach within participatory design, which has emphasized design as the meeting of language-games or communities of practice aiming at liberating change. I have described how participatory design research has drawn upon action research, which also takes as a starting point the practices concerns when aiming at liberating change. Both traditions also have typically drawn upon ethnographic methods, which are shortly described. I have also discussed that the validity of the design needs to be accountable to both the practices designed for, but also the research community one belongs to. How valid the results are depends on how meaningful the different groups belonging to the practices find the changes. In relation to the research community the validity of the results depends on to what extent the research has considered different design alternatives and what stakeholders have been taken into account and how these results are accounted for and connects to the concerns of the design research community. Further, the validity of the results depend upon how your own research community values the translations made of the constructed data and the connections made to other research of the constructed data. Lastly, in this chapter I have also presented the activities conducted in the two research projects in order to construct data. The following two chapters will turn to the translations performed of the data constructed during the two projects.
5 MAKING AND USING SELF-PRODUCED MEDIA

This chapter focuses on the design experiments conducted at the intensive care unit. The design experiments presented are discussed as lessons learned about what it can mean to design support for learning and knowing within a local professional practice. Our experiments attempt to study the possibility of developing technological support for informal learning spaces where experience and meaning making take on material and spatial form. At the heart of the matter is how knowing can be reified, transported, and intertwined in day-to-day activities. In doing so I will focus on what notions of meaning making are put into play by both the researchers and the practice, paying special attention on how they are materially configured, and how these socio-material configurations “conceive and pre-structure” the practice’s problems and needs. That is, in what ways does this materiality shape, influence, enable, and constrain the establishing of spaces for informal learning and in which manner can they be ‘implemented’? This chapter will focus on how new socio-technological relations are forged between tools and practice or with attention to “which logics will yield what consequences” (Berg 1997).

I will argue that we cannot think of tools and practice as separate entities. Rather, we need to view them as relational and pay attention to how they recursively affect each other. In this way, the design process can be seen as a process of convergence where the “technique and setting mutually transform each other into each
other’s image” (ibid). Convergence, as Berg points out, implies that neither tool nor practice is pre-given. Further, “convergence” should not be taken to indicate a gradual development towards one fixed end or toward some ideal type horizon where the networks have become stable, “irreversible,” and all inclusive (Callon 1991). Convergence is and remains a process, forever incomplete, unending, and non-unitary. “Convergence” should not be equated with homogeneity or with the gradual emergence of a single all-encompassing logic” (Berg, 1997).

In the project we explore how the combination and usage of generic technological components, such as DV-cameras, handheld computers, barcodes, and practice converge and transform each other. Simultaneously, we also explore how self-produced video instructions, which are also a form of technology, become a form of protocol, work routines, become scripts for action, and converge with practice. We explore how both the making and using of video instructions transform both the practice and the instructions given. In both instances, these convergences are not fixed entities. Instead, both the generic technological components and the typified video instructions are temporary hardenings that are continuously defrosted and reinterpreted as they evolve and recursively affect each other. They are reifications that gain their meaning in participation. As such, these design explorations are no different from the ongoing oscillation of hardening and defrosting that occur when a practice is confronted with new equipment, develop and use new routines, protocols, or methods of documentation. In such instances, they constantly need to harden the practice to later pick it apart, both when performing the work as well as when reflecting upon its current practice. What this project seems to point out is that design can be seen as an ongoing process of appropriation. It involves temporary hardening and defrosting as new ways of learning and knowing are weaved into and transforms the current logic of meaning making. New spaces of learning and knowing are weaved into existing spaces of meaning making.

The chapter starts out describing and analyzing a set of initial and open-ended explorations of which kind of technology would support learning and knowing. These explorations specifically focus on how different material configuration, or inscriptions, might support meaning making. One set of experiments point out that contextualized information retrieved on small displays may be used to engender individual learning and knowing in close connection to work. Another set of experiments explore the potential of shared meaning making through making and sharing self-produced videos.

The second section of the chapter discusses a set of experiments built around using mobile video instruction. These experiments discuss how the inscribed qualities in the technology, the handheld computer, video player, and the video, affect
and are affected by the practice. The experiments demonstrate how the use of these videos is not an individual meaning making activity, but a highly collaborative activity that demands congruence findings not only between the instruction and the work at hand, but also affects immediate collaboration, identity, roles, and other ongoing activities. The use of the videos demands considerable amounts of defrosting of both the locally made instructions. How the technological qualities of this endeavor should be appropriated into the immediate activities also required reinterpretation. Recursively, these different situations affect the meaning of the inscriptions in the technology.

The third section of this chapter focuses on design experiments that study in what way location and meaning making are related. These issues are explored when we try out different ways of tagging the work environment with video bar-codes. The chapter discusses how we initially envisioned that the videos could be pinned down to a specific location, which turns out to be too rigid a configuration of where accessing the videos might be done. Furthermore, the experiments demonstrate that different parts of the environment at the unit have already been inscribed with meaning that require new inscriptions placed into these locations to incorporate and take into consideration.

The final and fourth section of this chapter focuses on the meaning making that is put into play when making instructional videos. In the beginning, the meaning making envisioned was that it should be efficient and technically simple. This is, however, transformed into a collaborative meaning making process where aspects of the practice are articulated and critiqued. Efficiency is replaced by establishing spaces for learning where the staff has the opportunity to critically reflect upon their own practices by collaboratively constructing reifications that transform the practice and vice versa.

5.1 PROTOTYPICAL EXPLORATIONS

The prototyping study, conducted between January and May 2001, started with a workshop where we broadly explored several design possibilities of technology. This initial exploration would be later narrowed down and its possibilities explored through the staging of small scale experiments at the unit. From this field study, we were particularly impressed by our findings that collegial learning and knowing intertwined with day-to-day work was valued by the staff. Also, we found that the staff valued the importance of collaborative reflection. We were also impressed by the staff’s ongoing redevelopment of their practice and their use of contextual information to configure and reconfigure their work environment.
5.1.1 Staging future scenarios of learning and knowing

When we first began our technological explorations, the meaning making we wanted to put into play and explore was mainly those that were integrated with day-to-day work. We hypothesized that the material configuration that such meaning making could best be supported by was small mobile devices. The devices presented at the workshop focusing on the possible future use of technology, were simple physical models such as mobile displays in varying sizes, a digital pen and paper, which we imagined could, for example, be used to share temporary notes connected to patient data sheets. Other options presented included digital tags that could be used to link digital technology to physical devices or surroundings, sound recording devices used for leaving and retrieving temporary messages between the staff, and marking devices that we imagined could be used to collect data from different medical technical equipment and monitoring devices.

The exploration began with a simplified map of the unit where miniature representations of the different professions at the unit and the technological artifacts present were placed. During this workshop, which took place in an empty patient room at the unit, nurses and nurses’ aides explored and imagined future scenarios of learning and knowing (meaning making) as part of their day-to-day work with this map and miniature representations of their workplace.

The material configuration that the workshop participants were most interested in was the possibility of tagging information in their workplace that could be retrieved with small displays. They listed several possible instances where tags could be rel-
 Tags could be used to link information on how to control the respirator and how to fill in the examination sheet and in-depth pharmaceutical information on a medicine. One of the nurses’ aides spontaneously demonstrated a scenario by fetching a resuscitator located close by, picking up a tag and a small display, explaining that resuscitators were frequently incorrectly assembled, placing a tag on the resuscitator, pretended to read off the tag with a small screen as she explained that this would display a combination of short text and still images which would help with the correct use of the medical device.

Using hypothetical situations and scenarios, the unit staff discussed and reflected on what it means to know at the unit and how the material configuration of contextual information and small displays could possibly affect issues of learning and knowing. These scenarios and enactments showed that the nurses and the nurse’s aides found it useful to augment their work environment in order to perform the range of procedures demanded of them and that having such support in proximity to the work was meaningful.

The rationale of this material configuration was that instructions used as aides in day-to-day meaning making could be strongly linked to specific places, and by doing so, meaning making could optimized if placed in the right location. There is a close inter-relation between meaning making, instructions, and artifacts. The nurses and nurse’s aides were, however, concerned that this type of physical configuration would make them less pro-active in new routines and that dependence on it would mean that they would not update their knowledge base until they were confronted with the new task at hand. They saw a risk that this new material configuration would engender passivity towards learning and knowing. They suggested therefore that perhaps this material configuration of learning and knowing would be best suited for rarely performed procedures rather than primary ICU nursing know-how.

The staff believed that the technology could also be used as a verifying reference or checklist to known practices, thus aiding them, and helping them feel more
secure, in performing prescribed procedures. This material configuration could function as a memory aid. They felt that the technology should not structure the practice in such a way that the staff would become passive students, only retrieving and following instructions when needed. They wanted the technology to acknowledge the need for motivated, active learning.

The workshop, as such, pointed out future possibilities and problems with the material configuration of tags and small displays. It showed how such pre-structuring of needs through material configurations are highly entangled with notions of meaning making. Tags and displays are not discrete objects but are directly connected to social circumstance where the relationship between different entities creates a specific ontology neither located solely in the technical nor the social. The social and material are highly intertwined as socio-technical or socio-material hybrids connected to other activities of knowing and meaning making such as competence development strategies or the disinfecting medical equipment (Latour 1999, Berg 1997).

Although the workshop demonstrated hypothetically that tagged instructions retrieved with small displays could be meaningful, we did not know if this would apply in real practice and whether it would be effective in aiding the acquisition of knowledge. We also needed to explore what type of displays could work, where tags could be placed, and what type of content might be relevant.

To get a clearer picture of how tagged artifacts that would allow small displays to display pertinent instructions and information on the artifacts themselves, we asked two staff members to carry with them a mock-up display and some tags during a shift. They were given several different sized cardboard with a sheet of paper glued on top representing a display. These cardboard mock-ups had no interactive functionality defined, such as knobs or menus, to avoid any discussion on the details of interactive features of the software and hardware. Having done this, we asked them to inform us where they would want to retrieve information, what type of information would be relevant and how they would find it useful. We wanted to know if the information we would provide would only be text based, purely visual or a combination of the two.

Both staff members selected display sizes that were similar to standard handheld computers that easily could be carried around and that would fit in the pockets of their coat. The meaning making imagined with this material configuration—small displays that would fit inside a coat pocket—was that it would be an individual device for supporting learning and knowing. What was envisioned was that every nurse and nurse’s aide should have their own mobile display and would use them individually. These devices would be carried in a coat pocket and would thus be
The underside of such mobility and access would be the concern that the devices could easily be damaged.

The nurse and the nurses’ aide taking part in this staged scenario found a range of situations where tagging digital information to physical artifacts could be meaningful. They, for example, suggested that patient supervision sheets could be tagged so that information regarding patients’ medicines could more easily be retrieved. They also suggested that the patients’ identification bracelet could be tagged so that they could retrieve information on whether the patient had had their blood group typed and cross-matched. This scenario raised the question of whether tagging the patient, which would mean that the staff would need to scan the patient to retrieve a particular set of information, is ethically sound as it would turn the patient into an access point for information retrieval.

The two participants also suggested the use of this technology for more unusual practices and tasks that were less frequently performed. For example, the supervision monitor could be tagged to display how seldom used medical devices are operated. Such a scenario presented itself during the time of our study. The nurses in one of the patient rooms had difficulty operating a portable ECG apparatus that was seldom used. Thus our participant nurse aide demonstrated how a tag placed on this apparatus could be used as information on how to operate this device could

Figure 29: The nurse and the nurses’ aide taking part in this staged scenario found a range of situations where tagging digital information to physical artifacts could be meaningful.
be retrieved on the portable handheld computer. This information, in this case, how the electroes would be connected to the patient, would combine both text and still images for optimal meaning making.

This staged scenario pointed out that small displays and tagged information could be useful. On the one hand, tagged information could be useful for frequently performed activities. On the other hand, the meaning making put into play would be useful in helping the staff in performing tasks that were less frequently performed. It also suggested that retrieving instructions in the midst of work, switching between performing an activity and looking up information on that particular activity, was practical and plausible. Furthermore, this staged scenario showed that the technology used for the retrieval of instructions would be most effective if it would be available on an individual basis.

5.1.2 Sharing of meaning through self-produced video

Collaborative meaning making was appreciated by the participants of our workshops. The staff expressed frustration with the fact that even though there were many activities centered on developing the unit’s practice, the results of these activities were insufficiently made known within the unit. To explore if sharing of knowledge and experience through collaborative meaning making could be supported with new technology and rich media, we also explored if it would be useful to have ICU TV channel while we explored the potential of using small portable handheld devices containing tagged information. We wanted to explore whether it would be useful for the staff to have self-produced informational videos available in the coffee room. We hypothesized that perhaps this would support the acquisition of knowledge and experience across competence groups and professions and would thus trigger collaborative reflections on the ICU community’s practice.

In preparation for the concept of an ICU TV channel, we needed some initial video material that could be used for the study. Several staff members were willing to make short movies with us. All the movies turned out to be short instructional demonstrations on how to operate different medical devices. What was intriguing during this process was that despite having little preparation, the staff made good quality material. We basically just held the camera and the staff, with their know-how, spontaneously provided invaluable instructions to their colleagues on the operation of the particular medical devices. The strong tradition of oral instruction within the ICU became apparent in this exercise. The film sessions demonstrated that the medium of video could be an invaluable resource in the ICU.
Our observation made us realize that the discussions in the coffee room often centered on issues posted in a Today’s Information folder, which was positioned centrally on the main table. This central location allowed the staff close access to this folder and thus encouraged them to peruse the information contained within it. We thus hypothesized that it would be possible to build on the social and physical qualities that were present in the coffee room.

Taking the experience of Buur & Søndergaard’s Video Card Game (2000) and Sokoler and Edeholt’s video table (2002), which explored the possibility of creating a physical link with tags to video sequences used by designers, we prepared video barcode cards (sized A6) containing a snapshot from the video, its title, its barcode, and its length. Longer movies were divided into chapters with subheadings, each with an associated barcode, making it easier to select certain parts of the movie for viewing. We believed that having the movies physically present through video barcode cards would make them more visible and accessible compared with the use video cassettes or CD-ROM’s that the staff would have to fetch and put into the video recorder or a computer. Dividing the longer videos into subheadings would allow meaning making to be more efficient and to the point because this would allow the staff to access the information that is pertinent to their particular needs.

This video and the barcode feature was presented to a group of staff members, mainly nurses and nurse’s aides, at their Friday breakfast in the coffee room. We demonstrated to them how to retrieve videos through video barcode cards. Video barcode cards were given to the staff present at the breakfast and some of the videos...
that had been already produced (described above) were shown on a small wall-mounted television set next to the main dining table.

The staff found these videos useful and felt that the videos were close to how colleagues would teach each other in real life situations. They also stated that it was better to see a colleague in action on the video than read written instructions. However, what surprised us was that they were not interested in having these videos in the coffee room. This was due partly to their wish to keep this area a place where they could eat, relax and converse during their breaks. Turning the coffee room into an explicit learning environment was not wanted. They also felt that the videos would be more directly relevant out in the work environment. They therefore suggested that it would be more appropriate to have them available on stationary computers in the patients’ rooms. They envisioned that implementation of the videos would be more useful and à propos when placed within the confines of their work activities rather than in a break room. We therefore decided to explore if it would be possible to combine the two design ideas explored so far. Would it be possible to combine contextualized information retrieved on small displays containing self-produced media? This meant that we needed to study how the staff could make their own informational videos for portable display devices in the midst of ongoing work in the ICU.

5.2 USING MOBILE VIDEO

We were interested in how learning and knowledge acquisition were closely intertwined with work. Having the videos available on the stationary computers in the patient rooms as had been suggested by the nurses and nurse’s aides would be suboptimal because it would mean that the information provided would still be detached from a prescribed work location as a particular demonstration in a video might not take place within the confines of the stationary computers. None of the videos produced thus far had to do with the work conducted around the stationary computers. For example, a demonstration on cleaning bronchoscopes was for the most part relevant to the washing room which is far away from the patient room. In addition, although some of the videos dealt with work conducted in the patient rooms, viewing them on the stationary computers meant that the staff would have to go back between the computers and where they would perform these procedure—a distance of a few meters. Having the videos more closely coupled to the work at hand was therefore something we wished to explore. The meaning making we wanted to set into play was a closely integrated method of learning which would allow freedom and mobility in its configuration.
At this stage we did not know how the material qualities inscribed in such a technology would affect work and whether it would be an effective way of knowledge acquisition. Would having a small handheld device mean that performing the prescribed activity would become difficult as one of the nurses’ or nurse’s aides’ hand would no longer be available to perform the task at hand? Would the screen size of the portable device suffice? Would the videos need to be divided into subsections? Would it at all be possible to both perform the demonstrated activity and follow the video instructions at the same time? How detailed would the videos need to be? How long should they be?

Our initial experiments answered these questions and will be described shortly. However, what we did not expect, but became apparent as we continued to explore the use of the videos, was that we needed to look into whether it would be appropriate to use the video in all locations. Would using the video, for example, be appropriate in patient rooms or would it disturb the patients? How would their use affect the perception of competence and professionalism? Furthermore, we did not anticipate that the videos would be used mainly during collaborative activities. What type of meaning making activity would this unexpected collaborative learning put into play? How would the reification function in such activities of participation?

5.2.1 Initial exploration of using mobile video

Initial exploration of more contextually sensitive use of the videos was set up where two nurses were asked to use the video on how to clean bronchoscopes while performing this demonstrated task. In the first test session, the video was played back on a Sony Video Walkman (a small video player). The walkman was too big and heavy for the nurse to hold and so we had to hold the device, start and stop the video upon her request. However, performing the demonstrated task, while watching the video demonstration, worked out fairly well. For the most part, the nurse was able to watch the video while simultaneously mount the bronchoscope into the washer. At two particular moments, she expressed that she would have liked to be able to freeze the video demonstration so that she would be able to more closely see how certain more intricate components were done. After the session, she stated that the video was clearer than written instructions and more engaging. Furthermore, she stated that this form of video instruction was especially pertinent in the care of such expensive medical equipment as bronchoscopes.

In the next session, using the same movie in the same setting but now equipped with a handheld computer, we found that it can be difficult to watch the video for the first time and simultaneously performing the task. Even though the video demon-
strates how the task is done in a normal pace, the nurse involved with this session, being less experienced in performing the task, was not able initially to do the prescribed steps of mounting the bronchoscope into the washer at the same pace as the demonstration. The nurse pointed out that a better strategy would be to watch the whole video first and there after watch short sequences and than step by step perform the task. Following the movie in real time without having viewed beforehand while performing the demonstrated task was too demanding.

The use of small handheld computers was our attempt to more closely integrate this meaning making with the spatial and material circumstances of the work at hand. One of our concerns, however, was whether the small screen of this device would suffice. Another concern was that the staff’s general attitude was that the videos should be concise and not exceed three to four minutes in length if they were to be used in daily work. Some of the videos that had been made exceeded these constraints and we speculated that they would need to be divided into concise chapters.

With these concerns in mind, we asked a nurse to use a video, made by the unit’s physiotherapist, on how to mount a CPAP machine in the medical technical room where the machine often is mounted. The video was about twelve minutes long. The first half was divided into five short sequences of one to two minutes in length. This was presented as a play list in the media player. The results from this test session showed that the small screen (240 x 180 pixels) was largely adequate. The nurse noted that though at times it was difficult to see which components were shown, this deficiency was made up by the physiotherapist’s verbal explanations. For the most part, she was able to watch long sequences and concurrently mount the machine. There were, however, points during the video when she needed to pause the demonstration in order to finish the step that she had just viewed. The portable size of the handheld computer allowed her to view the video up close while she was performing the mounting procedure on the CPAP machine. She was able to re-watch sequences of the video to verify that she had performed them correctly.

Figure 31:
Two nurses trying out if mobile video instructions can be used while performing the task.
Only at times did she find it awkward for her to both hold the handheld computer and perform the procedure (while checking that she had all the required parts for the task, she had to place the handheld computer and the different parts onto a nearby bed).

The nurse did not find the twelve-minute video too long and felt that subdividing it into separate chapters was perhaps superfluous. This unexpectedly demonstrated to us that a standard length - such as a maximum of three to four-minutes-- was not an inherent *a priori*. Whether the video would be quick and easy to use in a clinical situation was a complex issue not circumscribed only to its length. Relevant content was a much more important corollary. In this situation, the self-produced training video was tailored to a specific task in the ICU and its twelve minute duration was acceptable.

The three test sessions that we have described took place in locations that were separate from the arena of actual patient care and clinical work. The first session with the Sony video walkman occurred in the unit’s washing room and the second session in the medical technical storage room. These two locations were chosen because they were where the cleaning of bronchoscopes and mounting of the CPAP machine typically would be done. The social framing of these test sessions, although “realistic,” need to be elaborated upon. First of all, the nurses in both of these sessions were alone and did not need to pay attention to other possible responsibilities they might have had had they been in an area of patient care. Furthermore, they did not need to concern themselves with the presence of other members of the ICU staff. Thus, they were allowed to focus on a single activity in an area far away from the main clinical arena. This “backstage” meant that they did not have to worry about how their colleagues might perceive their competence and professionalism.
5.2.2 Using video in a patient room

The technology of self-produced videos viewed on handheld computers studied during the initial exploration was conceived to be individual memory aids and checklists. The decision to use a small display device was based on the premise that they would be used individually. This inscription was thought to allow a closer proximity between the work activity and the use of the memory aid. However, this premise turned out to not hold ground as our subsequent design explorations demonstrated that the devices were also used in a collaborative setting involving more than one individual. In such cases, the two or more nurses and/or nurse’s aides needed to share, sometimes with difficulty, the same device. They had to coordinate and negotiate between themselves how they would view and at the same time perform the prescribed task demonstrated by the instructional video.

Using this technology inside a patient room also was different from using it in the medical technical room, washing room, or the unit’s small library. The social framing including the socio-material circumstances are in many ways completely different. The patient rooms are “center stage” — arenas of actual clinical care where the nurses and nurse’s aides performed and displayed their clinical know-how and abilities. This is where other professionals congregate and at times, patient families are also present. The patient rooms are open rooms that can accommodate several patients. This open organization of the rooms allow the staff to oversee and attend to several patients at a time. The physical organization is thus directly related to ways of organizing work and resources both human and non-human. These rooms can, if needed, be made semi-private by partitioning them into distinct zones by setting up dividers around a patients’ bed. For the most part, however, they are left open. Inscribed into this configuration is that the staff should have an overview of the total activity in the room, even though they might be responsible for and attend to only one or two of the patients in the room. The nurses and nurse’s aides are expected to have an overview of all the activities in a room but they are also expected to not disturb each other’s activities more than necessary.

It is therefore not surprising that an issue was raised during our study on whether it was legitimate to use the videos in patient rooms. Would it be a sign of incompetence as perceived by the other staff members, conscious patients, and relatives who might be present? Would the video demonstrations disturb sedated patients or other staff members caring for their patients? Even though the nurses frequently used different forms of documents as memory aides to help them perform their duties, these were silent artifacts and not extroverted demonstrations involving sight and sound.
To explore these issues raised, we asked two nurses to use instructional videos on “Fixation of endotracheal tubes” and “Taping of nasogastric tubes” inside a patient room. One of them is an experienced senior ICU nurse while the other is a new ICU nurse being oriented into the unit. Their task was to change the adhesive tapes holding in place a patient’s endotracheal tube and nasogastric tube while watching the instructional video on the small portable handheld computer.

We found that the nurses were able to use the videos as learning-aids in this situation, but that success was dependant on the activities going on in the room. The video demonstrations did not disturb the sedated patient. The nurses did not find it problematic nor did they feel that it was a sign of incompetence using this technology even with awake patients and colleagues working close by. Also, the videos did not appear to disturb the other staff. At one point, four physicians entered the patient room to discuss the status of another patient who was about four meters away. This interruption prompted one of the nurses taking part in our study to pause the instructional video and to resume it only after the physicians had left the room. It appears that the appropriate use of an instructional video cannot be predefined but depends upon the staff present and what is going on in the room.

We had not anticipated that the videos would be used in a collaborative manner to the extent that they were. In these collaborative situations, the staff found new methods to coordinate their learning and practice together. I will describe two different collaborative situations below.

The first collaboration involves the senior nurse in the ICU who was helping the student nurse learn how to secure a nasogastric tube while she was learning this procedure with the handheld computer. He approached the student nurse whenever she was unsure about a particular sequence of the task and he provided additional information that the video did not contain. For example, he explained to her how she could more easily cut the adhesive tape. However, most of the time, he was not involved in watching the video demonstration himself. Even though this was a beneficial situation for the student nurse, there were also unexpected tensions that arose. For example, in the instructional video, the instructor emphasized the importance of using a narrow strip of adhesive tape when securing the nasogastric tube. The video demonstration emphasized that this should be done by dividing a broad piece of adhesive tape into a narrow strip instead of using the prefabricated thin adhesive tape that was available in the ICU. While the student nurse took this instruction seriously, the senior nurse himself was upset by such a restriction and only begrudgingly complied with the prescribed instructions from the video. When they were ready to tape the nasogastric tube, the student nurse insisted on using her carefully divided and narrow strip of adhesive tape rather than the senior
nurse’s broader strip and she legitimized her choice by quoting the instructions from the video. The senior nurse acquiesced but made it known that either strip of tape would have been acceptable. He did not accept the instructions from the video as authoritative and immutable. Although their collaboration was somewhat contentious, they were able to carry on professionally and their collaboration did not fall apart.

The tension that developed during this collaboration might have been avoided. In the second collaboration that I will describe below, two physiotherapists collaboratively use the handheld computer, first watching the demonstration video together before their subsequent performance of the demonstrated task using the video. This collaboration occurred in a later phase of our study and is a actual use situation rather than a test session set up by the researchers. The two participants were involved in learning how to mount a Fisher & Paykel humidifier to a mechanical ventilator.

Ulrika, a newly employed physiotherapist, is in a training session with Jenny, a senior physiotherapist. Jenny is a bit uncertain on how to connect the humidifier to the mechanical ventilator because she has been on leave for the past two years. They decide to watch the video on the stationary computer in one of the empty patient rooms. They bring along the expiration valve, which is the main device they are uncertain about in this procedure. As they watch the video, they compare the valve they have to the one that is being shown in the video. They listen and watch closely the instructions on how it should be mounted. After watching the video demonstration together, they proceed to the medical technical room and, without further repetition of the video, mount the valve to the mechanical ventilator. They are, however, unsure whether they have done this correctly. At this point, Jenny suggests that they should use the handheld computer to verify their result. As they had missed the meeting where the use of the handheld computers was explained, one of the researchers gives them a short introduction on its use. They then proceed...
to watch the demonstration video with the handheld computer, comparing it to how they had performed the task. Ulrika notices that the flow sensor is mounted to the mechanical ventilator before the expiration valve is connected and that they had done this in reverse. They thus remount the flow sensor and the expiration valve in the correct order. A little later, when they are about to mount the filter to the humidifier, they watch the video and it is explained that the filter may need to be changed two times a day. At this time, Jenny complements the information provided by the video and says: “There is quite a lot of condensation in the tubes. Sometimes you may have to open up and empty the tubes if you’re allowed to interrupt the circuit.” Thereafter they finish the installation.

In this example, the collaborators watch the video instruction separately from where they perform the task. They find the information provided useful and feel comfortable performing the task on their own. Watching the video together gives them a shared view of its contents. As they engage in the activity of mounting the humidifier, however, they become stuck and this prompts them to learn how to use a handheld computer in order to verify their performance. They then use the handheld computer to successfully accomplish the task. Both participants are in continuous dialogue with each other, the video, and the equipment. The space of action of knowing and meaning making that they are engaged in involves the equipment, the videos and their own prior experience. Though these different elements
are in of themselves incomplete, they overlap and complement each other. After having assembled the equipment, both participants stated that they had learned from each other and had thus contributed to solving the activity facing them. This example shows that the two colleagues may draw on each other’s experience and knowledge, with the information provided by video instructions, and successfully use the equipment in front of them to acquire new knowledge and meaning making. The different elements that make up the activity of meaning making thus complement and overlap each other. As such, the example shows that having the handheld computer in close proximity to the activity at hand has its advantages and engenders a different form of meaning making. Furthermore, the example shows that having seen the video together at first makes it easier to collaborate subsequently while using the video in the performance of a task.

5.2.3 Negotiating roles when watching video

Use of the handheld computer, as the example from the patient room showed, can be strained when two colleagues negotiate how the equipment should be incorporated into the ongoing clinical activity. Use of the videos in a collaborative manner demands not only negotiating who should have access to the video, but also negotiating what roles should be taken. I will demonstrate how its use in some instances is volatile and intertwined with established and conventional views of knowing, teaching and learning. These conventional views of knowing, teaching and learning are not something that a project can disregard.

Frequently, two staff members working together on a task, use the video as a guide. In such collaboration, a new artifact is introduced into their collaborative effort and new ways of coordinating the activity are needed. As in the production of the videos, the configuration and articulation of what it can mean to know and learn with the artifact is not something that can be determined once and for all. It is a process that is open for negotiation.

Kristina is about to connect a humidifier to a mechanical ventilator. She has worked at the ICU for three years. Having missed the course on active humidification, she looks for assistance. Ansti, an experienced nurse working in an administrative capacity in the ICU, comes to her help. She fetches the humidifier that she places on a small mobile table a few steps away from the ventilator that is placed on the right side of the patient and in preparation watches the video. On the left side of the patient, Kristina finishes testing an extra mechanical ventilator that the patient has to be temporarily switched to. Kristina asks Ansti if they should prepare anything else before switch-
ing him over to this spare mechanical ventilator. Triggered by Kristina’s question, Ansti decides to postpone switching the patient over to the spare mechanical ventilator and instead suggests that they start with connecting the humidifier chamber to this spare mechanical ventilator.

Standing next to each other by the table, Ansti jumps into the video. She bypasses the introduction and begins the connection of the valve. Ansti hands the humidifier chamber over to Kristina and having seen how it is done she gives instructions on how to connect the chamber to the mechanical ventilator. Ansti then restarts the video and confirms that Kristina has done the assembly correctly. Ansti and Kristina continue connecting the tubes and the heating cables with Ansti in charge of the handheld computer communicating part of the time to Kristina the contents of the video.

When Kristina went and asked for help, she started a process where places of action are constructed, where responsibilities are negotiated and commitments made. In this process, she actively seeks assistance in the role of a full member in her community of practice. The assistance is not forced on her and she does not perceive the place of action as a learning setting, but rather as a way of solving the problem she is confronted with. She is in charge of and responsible for the patient and takes an active role: testing the extra ventilator on her own. When she asks if they should prepare anything she invites Ansti to join her in deciding how to proceed.

Ansti accepts Kristina’s role of being in charge of the patient. However, when they start mounting the humidifier, Ansti sees the place of action as one of learning where, as she explained, she feels responsible to walk Kristina through the task. Ansti has therefore watched the video to be better prepared for this commitment. Having watched the video in advance, Ansti has an overview of the task and the content of the video. When they start watching the video together, Ansti thus takes charge and skips through the video, deeming parts of it irrelevant for Kristina. She assigns herself the role of the tutor having main access to and control of the video player. Kristina’s role is to get hands on experience and Ansti steps in only when she gets stuck. She communicates what is going on in the video while Kristina is doing the mounting and she ascertains that Kristina assembles the apparatus correctly. Ansti perceives herself as Kristina’s primary instructor. The video is foremost to aid Ansti in the role of the tutor. Kristina commits to the role of being the one that follows the instructions partly from the video and partly from Ansti.

As Ansti and Kristina get deeper into the work of assembling the apparatus, this tutor-student relationship unravels:
Ansti restarts the video and jumps to the part “on filling the chamber.” She is unsure about the amount of water that is needed. Kristina states that this is self-regulating. Kristina hands the power cable that goes behind the mechanical ventilator to Ansti and connects it to the power outlet. They proceed to configure the ventilator to run on active humidification. This is complicated by the fact that some of the ventilators have not been upgraded to allow this mode of ventilation and they are unsure if their ventilator is upgraded to allow this capability. To save time, they decide that Ansti should go and ask if their colleagues know about the status of the ventilator. Kristina then proceeds on her own to connect the humidifier filter, and then, assisted by two nurses’ aides, switches the patient over to this spare ventilator that is now mounted with the humidifier. Ansti returns and reports that the ventilator now connected to the patient is not upgraded for active humidification. They proceed and finish the task.

Although Ansti for a period of time takes charge, it is clear that Kristina is a competent nurse that not only actively but also critically takes part in the assembly of the apparatus. Her prior experience is not excluded from this collaboration. When they fill the humidification chamber, Kristina shows that she has some prior knowledge about the device. As Ansti is unsure about this, she has no problem returning to a more collegial relationship, taking the role of the assistant when connecting the

Figure 35:
One of the nurses perceives herself primarily as the instructor and the video as foremost to aid her in the role of the tutor.
humidifier to the power outlet and when they do the ventilator function control. While Ansti is getting information about the ventilator, Kristina goes on to connect the filter and switching the patient to the spare ventilator. She becomes the active participant who is responsible for accomplishing the task.

In the case, the use of handheld instructional video in the ICU was informal and not part of an explicit learning setting. Further, although the instructional videos demonstrate best practice and have a certain authority, they are considered to be examples of how a task can be performed. Ansti, triggered by Kristina’s question on whether they should prepare anything before switching the patient over to the spare ventilator decides to postpone the action. She does not hesitate on postponing this action even though she knows that it means that the chronology in the video will not correspond to how they will carry out the specified task. Obviously, the video does not and cannot account for all problems possibly encountered in real life situations. This does not render it obsolete because the video provides only an example of how to connect the humidifier and being an experienced nurse Ansti knows that tasks can be competently done in many different ways. The video shows just one way out of many. Ansti actively creates a new approach following the instructions in the video by jumping back and forth on the timeline as needed. What the video does not account for and they cannot solve on their own, they look to other colleagues in the unit to provide the answer.
The roles that Ansti and Kristina commit to, although drawing upon prior experience of learning, are not stable preconceived schemas. The space is never explicitly defined as a learning setting or a work setting. Rather, it moves back and forth between being an informal learning setting as perceived by Ansti to being two colleagues solving a problem as perceived by Kristina. Ansti’s initial tutorial role never defines completely the space of action; Kristina’s prior experience is not excluded and her role as the active participant is not questioned. Although drawing upon known roles, Ansti and Kristina never rigidly commit to them. This leaves the space of action thus constructed open for negotiation as they proceed in their task.

These experiments with using mobile videos showed that the design activity of choosing a small screen, the right video player that could freeze an action sequence was a useful hardening inscription that made it possible to integrate the viewing of the video closely to the work at hand. However such inscriptions put certain constraints on what type of situations such memory aid can be successfully used. In some instances, strain can occur when viewing and using the instruction videos collaboratively.

Using the video although locally produced and in some sense not different from local routines or scripts for action, demands congruent findings between the content of the video and the activity, which always differs in some way, as the last example with Ansti and Kristina perhaps most clearly shows. The video cannot simply be applied but needs to be reinterpreted, adjustments need to be made and prior experiences used to complement and fill in where the video falls short. As such, Suchman (1987) is correct when he states that we should not confuse plans and scripts of action with situated action. This, however, does not mean that this technology fails. Instead, as the examples show, they are found useful by the staff as reminders and checklists. The handheld video instruction becomes a sort of referee, making sure that procedures and tasks have been performed correctly. The function especially well because they are examples of successful performance of the activities as performed in the unit. Our observation also demonstrated the videos did not need to be complete in the sense that they needed to clearly show every detail and cover all aspects of the activity. Rather, what the videos did not show clearly was complemented by the equipment in front of the nurses and nurse’s aides as well as the knowledge of those participating in the meaning making.

Finally, we found that the staff needed concrete examples of how this portable video technology would affect their work, their working relations, and possibly their work identity, which varies depending locations and situations.
5.3 CONFIGURING THE WORK ENVIRONMENT WITH VIDEO LINKS

The reason for making the link to the video physical and visible in the work environment was initially two-fold. First, the idea was that the video barcodes would make the videos visible. Having to search for the video sequences on the handheld devices risked making them invisible and thus also easily forgettable. Second, the idea was that staff could configure their work environment placing the barcodes on objects or specific places where such information would be needed, making them not only more visible, but also more easily accessible. This would avoid that the staff would have to click start a media player and click through menus on the handheld computer. We aimed to have a tight link between working and using the videos.

Having video barcode placed out in the work environment was built on our observations that the staff in some instances configure their work environment in such a way that documents that they use in their daily work are strategically placed close to where the task is typically accomplished. Earlier I discussed how the staff placed short instructions on how to mix pharmaceuticals in close proximity to where the mixing typically is done. They would also on the spot configure their work environment with explicatory messages such as “Obs! The strength”; pointing out to colleagues that they should play close attention to certain features of the technically dense and constantly shifting surroundings of the patient. We had also noticed that in some cases, short written instructions were tied to medical technical equipment. The CPAP armature had, for example, such a short instruction tied to it. This is the idea we played with when we asked an intensive care nurse to pretend to scan a video barcode to start the video on how to mount the CPAP (an apparatus that assists patient respiratory function) featuring the ICU’s physiotherapist. The idea that we played with was that the barcode to the video would be located on the device since that is where the video probably would be needed.

These spatial material practices fascinated us especially since we knew that digital material tends to disappear when placed in a desktop computer, and especially so if the person does not work at a desk with easy access to a desktop computer. Furthermore, we were inspired by such projects as Websticker (Ljungstrand et al 2000), The personal bucket organizer (Nilson et al 2000) and Cybercode (Rekimoto & Ayatsuka 2000), all projects that have explored the link between the physical environment and digital content.

Earlier explorations had pointed out that tagged information might be highly relevant and that the information could be tightly connected to a physical location or specific equipment making for easy access to the right information at the right place and at the right time. As one of the nurses stated: “I have to see the barcode
immediately else I won’t use them. If this system should be of any use the nurses need to have the barcodes placed in a logical way. The system needs to be hassle free and the barcodes need to be easy to find.” Given the results from our previous explorations we interpreted this to mean that the content should be placed on the corresponding equipment.

The initial idea was that the barcodes that came with the equipment could be used. This was, however, quickly abandoned since the barcodes on the equipment were not necessarily placed in such a way that they could be easily found. Secondly, by using existing barcodes it would be difficult to know if it linked to a video or was in fact a useless barcode. As such, a film icon would need to be placed next to it indicating that it is linked to a video. In dialogue with the nurses, we explored other possibilities such as having barcodes with colored backgrounds to distinguish them from ordinary barcodes. All of these suggestions built on the idea that the barcodes would be placed on the machine itself and the placement itself would speak of what video the barcode referred to.

As we continued to explore the issue of the barcodes, the issues of location became more important. We knew that barcodes in some instance could be placed on the medical equipment itself, which in turn would allow for quite abstract generic visualization solutions. However, this solution had quite serious limitations. First of all, some medical technical equipment needs to be sterilized demanding special durable and sanitary barcodes. Secondly, some medical equipment consists of several different components and this then demands that the staff put either a barcode on all the parts or decide which part would be most relevant to put the barcode on or, in other words, know when accessing the video would be most relevant. Fur-
thermore, some sterile equipment is packaged, which means that the barcode would have to be put on the package, which would be thrown away with the packaging after use, making it difficult to access the video subsequently.

Probing how the videos could be tagged started to reveal how the barcodes cannot be seen as discrete entities, but instead relate to other material practices or spatial configurations of the work environment already present. Realizing that tagging the videos directly to equipments or their components would in some cases not be possible or at least cumbersome, we started to explore if we could place video barcodes in the work environment in the vicinity of the equipment. To explore how the barcodes could be placed in the vicinity of the equipment, we decided to see how this could be applied with a video on pleural suction device (a device used in conjunction with chest tubes for creating a vacuum seal in the pleural space to prevent patients from having pneumothoraces, a deflation of the lung). The device is stored in a room for sterile disposable articles. This storage room consists mainly of large moveable shelves which can be expanded in two directions. Next to the shelves hangs a wall mounted rack listing alphabetically all the medical material and their shelf location. One idea was to include the video barcodes on this list. Although a feasible idea it would not guarantee that all staff members would notice the availability of the video. Placing the video barcodes in front of the equipment on the edge of the shelves was another idea explored and was seen to be even more appropriate since the one could not miss seeing it when picking up the device. But the person in charge of the storage room for sterile materials rejected the idea because that area was reserved for barcodes used to keep track of items in stock. Instead, she suggested that the video barcodes be placed on the outer edges of the shelves and positioned so as to indicate on what side and level the equipment could be located.

Another idea we explored was if it would be feasible to have the video barcodes grouped at strategically important locations instead of distributed and directly connected to the equipment or a specific location. We therefore tried out mounting on the wall a collection of video barcodes in the combined office and medicine room between two patient rooms. However, all of these ideas proved to be futile because the whereabouts of where the staff would need to start the video is not necessarily just at one specific location. Rather, the video would be needed to be started at multiple locations. We therefore decided that the most feasible idea at the time was to make the video cards mobile, i.e., as small sturdy and laminated cards grouped in plastic folders mounted on the wall at strategic places at the unit such as the corridor to the medical technical storage room and in the office between two patient rooms. Each video barcode card existed in multiple exemplars allowing for some amount of wastage of cards.
5.3.1 Using mobile video barcodes

The double function of the video barcode cards of making the videos more visible and more easily accessible was appreciated by the staff. They reminded them of their existence as well as pointed out when new videos had been released. Furthermore, it meant that the staff did not have to navigate through the menus on the handheld computer to start the videos. Having the video cards mobile turned out to be more in line with the different practices of using the videos, which the following example will illustrate. However, the example will also show how making the videos only accessible through the mobile barcodes can have its drawbacks and become somewhat inflexible. What was meant to be a short distance can in some instances become quite the reverse.

Kristina, as earlier described, is nursing a patient in room three, and needs helps with mounting the humidifier to the patient’s mechanical ventilator. Ansti, the experienced ICU nurse working in an administrative capacity, comes to help. Ansti goes to the machine hall, located at the opposite end of the ICU, to get the humidifier components. Just prior to getting the components, she gets the handheld computer, adjacent to the machine hall, fetches the video barcode card on mounting the humidifier placed on the wall above the handheld computer. She scans the card and watches the video to see what components she needs and to be better prepared to help Kristina.
Having watched the video, she goes to the patient room where she places the components on a small table at the foot of the patient’s bed. She scans the card again and places the handheld computer on the table. Ansti starts, stops, and jumps through the video and guides Kristina who sees parts of the video as she mounts the humidifier with the occasional assistance from Ansti. When they have watched the video and mounted the humidifier, Kristina wants to see the whole video in one sweep to verify that she has correctly mounted the humidifier so she scans the card and watches it in its entirety.

Viewing the video, as the above chain of events shows, is not as tightly connected to either a specific location or to specific equipment. The nurses need to access the video at different locations. To begin with Ansti needs to access the video before getting the components to the humidifier and before starting to assemble them together with Kristina. After having mounted the humidifier, Kristina wants to review the video to verify that she has performed it correctly. In this situation, having the video only accessible at a specific location would have meant that she would have had to leave the current set-up of her work environment. Having the video barcode connected to the humidifier, placed now beneath the respirator, would have meant that it would be quite awkward and perhaps even difficult to access. Tying the video to specific location or equipment would in other words mean that the nurses’ possibilities of configuring their work at hand would become unnecessarily rigorous and inflexible, not accounting for the such diverse needs as preparing, watching in connection with the actual mounting, and double checking that the equipment is mounted correctly, which happen in different locations and varying degree of proximity to the equipment.

As our story continues, when they are about to perform the function control of the humidifier, Ansti notices that a video on how to function control the equipment is also available. She goes back to the medical technical room and fetches the card to the movie. In this case what was meant to be a short-cut and easily accessible way to the video content becomes instead a cumbersome and inflexible interface demanding that Ansti and Kristina break up their ongoing work so that Ansti can go all the way back to fetch the function control video card.

Contextualized digital content thus turned out to be less simple than first anticipated. The whereabouts of knowing and learning could not easily be pinned down to a specific location or equipment. Furthermore, it points out that the physical environment is laden with meaning and experience that has developed over time. What was needed was a similar process of probing for a solution that would make do or be adequate and not so different from how Latour (1991) has described how a hotel manager needed to experiment with different types of inscription until a
satisfactory solution is accomplished. Placing barcodes thus not only has to do with where they best could be placed from the perspective of accessing the films, but it also concerns how the placing of the barcodes relate to other existing practices of marking up the work environment. As such, the barcodes receive their meaning through how they connect to other practices already at play in the ICU.

5.4 MAKING MOVIES: A COLLABORATIVE PROCESS OF REIFICATION IN PARTICIPATION OF “BEST PRACTICE”

We at first were concerned that making videos would perhaps be too time consuming and technically demanding. It was therefore important to find ways that would make the production of the videos to be efficient and simplified. As such, the meaning making rationale that both parties took for granted was that making videos should directly pay-off, be useful and not disturb to any large extent regular work activities, which is in line with Saljö’s (2000) observation that learning within professional practices is largely subordinated to the needs of production.

We therefore established together with the staff a simplified production process that did not demand writing scripts or a complicated post-production. Instead we established a few rules of thumb that should be followed so that it could be possible to make the videos without any initial preparation and very little post-production work after the recording. Furthermore, we needed to explore what relevant content was, which we did through making a range of videos together with the staff and subsequently analyzed them at informal reviews. These experiments pointed out general rules for both how the making of the videos should go about and how the content of the videos should be shaped. More importantly, the process of making the videos, which would often start with a “rough draft” that would be shown at an informal review, pointed out that the making of the videos was a highly collaborative activity of articulating what would be “best practice” as demonstrated in the videos. The staff was given the opportunity to critically reflect about their current practice and how it could be different. The meaning making put into play when making and reviewing the videos was thus a much richer space for learning and knowing than we had anticipated.

These processes of collaborative articulation, as had previously been demonstrated (Björgvinsson & Hillgren 2005), can be seen as an ongoing reification in participation (Wenger 1998). Reification in participation is something that the staff is quite used to since they are involved in an always ongoing rearticulating and redesign of their practice through the creation of local routines, new treatments,
as well as day-to-day strategies of configuring their work spaces, as they, under conditions of complexity and uncertainty, impose momentary order through framing and naming their activities and these activities talk back as described by Schön (1987). The concept of reification, in turn, is in many ways related to Henderson’s (1999) notion of conscription devices. Conscription devices create space for negotiation, function as a point of reference in discussions and allow members of different groups with different perspectives to work towards a common goal although they don’t necessarily have the same understanding of the object (Henderson 1999). These conscription devices resemble both Star’s (1989) notion of boundary object and the notion of inscription (Latour 1999), but differs in that they emphasize the changing and evolving character of the reifications.

In the following section we will follow four processes of making movies. All of them are highly collaborative processes where the staff is involved in an ongoing articulation of practice through reification in participation.

Initially, when we started exploring how videos could be made, we were mainly concerned with finding out how the production process could be simplified. However, as we jointly explored the making of the videos, the process of making the videos turned out to be a rich collaborative learning experience as colleagues jointly made “best practice videos.” Some of these processes not only helped articulate “best practice” of current ways of performing specific activities, but also, as the following process will show, facilitate the process of developing new routines as well as help probe new ways of performing current activities. The process described spans a period of over a year.

Having taken part in the development of a new routine on how to tape stomach probes, a nurse’s aide decides to make a video on the routine. Two weeks later, this nurse’s aide hears that parts of her film have been questioned at a film review. A spontaneous viewing of her film is arranged in an empty patient room where some nurses questions why she emphasizes that a specific tape has to be used. The nurses hearing her explanation, which is that with this specific tape, taping the patients’ lips could be avoided, points out that she will need to make this point clearer in the video, whereby they collaboratively make a new version of the video.

During the formal review of this new version of the video some weeks later, one of the nurses and the senior physician observe that in the video it is emphasized that a narrow tape should be used when taping the stomach probe, but that at the same time, other tubes taped to the patient’s face are too wide and cover the patient’s upper lip. Seeing this, the team acknowledges that apart from the importance of using narrow tape to secure stomach probes, it should also be used to secure other devices to a patient’s face to avoid covering, for example, the patient’s lips. In other
words, the video helped problems related to the use of adhesive tape to become visible where the instructions on securing the stomach probe could be applied to other similar situations.

Building on these observations, the participants in the review recommend that a new video be made clearly showing that all tubes and probes need to be taped with a narrow adhesive tape.

Later a nurse, as a result of the review of the stomach probe video, continues the articulation of “best practice” by making a video on how respirator tubes are taped to patient faces with narrow adhesive tape. Another nurse seeing the video decides to complement the video to demonstrate how the tape more easily can be cut and made narrower. Having recorded the alternative way of cutting the tape she arranges a spontaneous review. Although two nurses are positive, the nurse in charge of hygiene is hesitant. She points out that, although easier, using the glossy paper from the back of self adhesive labels as shown in the video could contain small residue of glue that could be transferred to the tape and cause allergic skin reactions. Though the idea is good, it would be advisable to find another paper for this application. They accept her point and decide to find another solution.

In the process of making the video, various colleagues thus take part in a collaborative articulation of their work practice, where different staff members contribute with their experiences and insights. The video, although showing the performance of only one colleague, is a reification that represents a variety of ex-
periences of various colleagues. For different individuals and areas of expertise, the reification through participation (Wenger 1998) that producing the videos entails seems to focus their communications and help them in moving towards a common goal. Furthermore, as this process shows, there seems to be a constant need for rearticulating aspects of their practice and in that sense, these reifications in participation perhaps more closely resemble Henderson’s concept of conscription devices that also function as focal points, but focal points or reifications that are constantly changing and evolving. Other instances have shown that when using the videos, the nurses and nurse’s aides, although finding it useful, will question aspects of the video. This questioning at times will in turn lead to redevelopment of the routine and a new video.

Similarly, the process of making a video on how to perform a bladder scan, which was made early on in design process when we still were exploring how to make videos, prompted exchange of views and resulted in negotiations, which influenced the video being produced. The process of making the videos gave a voice to various individuals. Each had a different perspective on their community of practice, which they shared and thus gained insight and learn from each other as they developed aspects of their practice. As the following example, the participants involved in the recording of the video, also facilitated its production as they dynamically shifted between reflecting-in-action, letting the situation guide them in what to include, and stepping back and reflecting on the result.

Margareta (a nurse) wanting to gain experience in making videos asked Bengt Göran (the nurse’s aide) and Lena (another nurse) to help her to explore how to make videos. They decided to make a video on how to perform a bladder scan. Bengt Göran, they decided, should be the patient while Lena should demonstrate how to carry out bladder scanning. They recorded the video in a vacant patient room.

Bengt Göran is lying in a patient bed and Lena and Margareta stand by the bladder scanner placed on a mobile table at the foot of the bed. Margareta holds the video camera in her hand. She asks Lena:

Margareta: How do you think we should start?
Lena: I thought by starting it up [the bladder scanner] so you can see where it all starts.
Margareta: Yes, that is what you are going to show, yes.
Lena: Should I do that in connection with the whole thing?
Margareta: Yes, you can just start...
Bengt Göran (interrupts): We first do a sequence where you prepare the equipment, then ...
Margareta (interrupts): Yes, precisely. Yes. And when you feel that it's time I can stop [filming], you know.
Lena: I don’t know what the buttons are called, but I know where to push.
Margareta: Yes, but then I will film that, you understand.
Lena: Shall I do that first?
Margareta: Yes, let me see... [Looks at the camera to find the recording button].

Margareta, Lena and Bengt Göran discuss how they should go about filming: whether to film in one continuous sequence or several short sequences. Confronted with the concrete situation of bladder scanning, the situation at hand speaks back to them and they discuss how they should give form to the film session and the bladder-scanning video itself.

Faced with the task of showing how to scan, Lena reflects on the fact that she does not know the names of the buttons but she knows which buttons to press and why. Margareta thinks this is fine and that naming is unimportant in this case. It seems that Lena's knowledge of scanning relies on having the equipment in front of her. The physical environment, especially the bladder scanner in this case, is used,
as suggested by Papert (1980) as things-to-think with. This implies that knowledge cannot be separated from the context or the medium that makes the expression possible, and that objects expand our minds and bodies.

They produce the video on bladder scanning by filming it in three short sequences retaking the first sequence once. Directly after the filming, they watch the video using the camera, and reflect on the result and its content. Margareta states that Lena did well but that she spoke softly. Lena agrees. They also agree that the video shows that it is not always easy get a good picture of the bladder. After the video is finished they continue discussing it.

Margareta: One thing you did not say is, well, how you actually operate it.
Lena: We have that picture in there, I had to leave it behind but a new PM has just been written for it. [A PM is a written description of how a specific task is carried out.]

For one minute Lena explains to the others what the work routine contains. She goes into detail about how many milliliters are standard and what to do if the scanning differs from that. In the end Lena says:

Lena: But usually, after narcoses, it can be up to 600ml as far as I have understood from the new work routine.
Margareta: Mmm, I was thinking even about this one [lifting the probe] – when one has to use the setting ‘man,’ when women have been operated upon.
Lena: Okay, that’s what you mean.

Margareta: Hysterectomy, yes.
Lena: Yes, yes.

A few minutes later:

Lena: Then some can have air in their bladder also from the examination, as I understand.

While making the video, Lena and Margareta dive into the situation, and become one with it. Ackerman (1994) has argued that moments of separation from the situation are also important in relation to learning. After the recording, they need to step back or distance themselves to impose momentary order to the situation. They
reflect on how the recording session went and on the content of the video. This is in line with Schön’s (1987) notion of reflection-on-action.

In the example, Lena misunderstands Margareta and explains the new scanning procedures, thinking that this is what Margareta misses from the video account. What Margareta really misses, however, is how hysterectomies are scanned. Discussing unusual cases, Lena explains that she has heard that scanning can be tricky after certain examinations since the bladder can contain a residue of air. Their dialogue shows that they have different experiences of scanning and therefore a different knowledge of what it means to bladder scan. Schön (1987) explains that practitioners construct artifacts as a way to discuss with themselves how to proceed with the problem they are facing. In such an instance, the artifact talks back to the practitioner and are actively part of the practitioner’s inquiry. An artifact, according to Schön, is not necessarily physical: it can, for example, be a physician’s diagnosis, a discussion, or more generally, the way a practitioner frames a problem. In making the video, Margareta and Lena have, in Schön’s terms, framed or imposed a momentary order on what it can mean to show how to bladder scan. When viewing the video, the artifact being constructed informs their ideas of what the video should contain and what is missing from the account. Ackerman, in line with Schön, makes the point that we construct, or in her terms, build forms of, or understanding of, a situation. We do this to share our understanding of the situation and to negotiate its meaning (Ackerman 1994).

The same week an informal review of the video was held with other people from the staff. It becomes apparent that the video needs to depict better how the scanner probe is handled. There is too much focus on what goes on in the bladder scanner display. The video also lacks information on how to set up the scanner for children or for patients who had had hysterectomies.

The following week a new bladder scanner film is produced. As we wanted more people to gain experience with the filming process, a new temporary film group is formed. Peter is the cameraman, Göran the person to be filmed, and Bengt Göran again acts as patient. All of them are nurse’s aides. We, the researchers, act as the intermediaries, explaining what has been said at the informal review session. Bengt Göran confirms that it is difficult to handle the probe. When they hear that they need to include information on the scanning of hysterectomies and children they start asking each other if anyone knows how to do that. Suddenly it becomes evident that all of them are unsure about what to do. Britt, a nurse’s aide, passes by and joins the discussion. She offers to go and find out what the procedures are. In the mean time they record a new video focusing on how to use the probe. While reviewing the resulting video, Britt returns and explains that women, who have un-
dergone a hysterectomy, and children under the age of 12 of either sex, are scanned as men.

The new version of the video is shown at an informal review. The video is considered to be good, but the reviewers want additional information on how to discover and handle sources of error in the video. For example, patients who have undergone laparoscopic surgery can be full of intraperitoneal gas while other patients have ascites (intraperitoneal free fluid in the abdomen). Two weeks later, Göran and Peter append the bladder scanning film with information on how unusual scanning cases are handled. Two months later the videos are formally reviewed by the people who are responsible for the quality within various areas at the unit. The last videos are judged to be very good and accepted for use.

Tracing the path of producing the learning material reveals that multiple voices within the intensive care community of practice shaped the videos. Each person contributed his or her knowledge and experience, which at times resulted in negotiations about the content and structure of the films. It became evident when knowledge was lacking, and which issues had to be investigated. Learning happened by discovering, while using the video medium to give form to their ideas, how to carry out the tasks, which were then discussed, argued for and justified. Learning happens on various levels. On one level it gives them a chance to discover and reflect on their work practice and, with this, how to make descriptions that can be understood by their colleagues. On another level, it gives insight into different experiences and

Figure 41:
Based on the comments from reviewing the first bladder-scanning video three nurses’ aides produce a new film focusing more on how the probe is handled.
how these can be given a form that helps develop the knowledge that exists at the unit. Making the videos was, therefore, both a dialogue with the physical situation of scanning, and a social peer-to-peer dialogue between colleagues.

The production and final acceptance of the bladder scanning video ran into several months. This was because more than one film had to be made and we were exploring what kind of video production process was needed. There are examples of much shorter processes. Still, common to all of them is that they are iterative processes involving several staff members.

The advantage of producing their own learning material is that the content reflects experiences of working at the unit: for example what to be observant about and what can be difficult. The production process being carried out in-house allows the video to be formed and transformed, reflecting the experience of the staff and therefore what knowledge is needed in their communities of practice. Many of the staff members have also reported that it is important for them to know the people in the videos, as it gives them assurance of how the activities are carried out in their work environment.

5.4.1 Reviewing self-produced videos a collaborative articulation

The reviews of the videos, which I will turn to now in more detail, began as informal reviews during the design process to discuss how the content of the videos should be shaped. These sessions, however turned out to be fruitful spaces for the staff to collaboratively reflect on their practice. In some instances the collaborative reflection helped them articulate why certain activities have to be performed in a complicated and cumbersome way. In other instances, it has facilitated not only the exchange of insights across professional domains, but also a changed practice. The videos, although made for the purpose of instruction are redefined as scenarios of work that can be reflected upon and questioned. These scenarios of work only show a small portion of the work, but work well because the staff’s experience complements the videos, connecting the reified instances of work that the videos are to a much larger context of participation within their community of practice.

As part of the research project, one of the physiotherapists at the unit had made a video on how to use and connect a Fisher & Paykel humidifier to a respirator. The video was later reviewed by an expert group made up of the senior physician, nurses in charge of competence development, the nurse in charge of medical technical equipment, as well as three other nurses. Usually the individuals that have made the videos also participate in the reviewing, but not this time. From the beginning,
the reviews of the videos were informal discussions to explore the form of the videos. Further into the project it was considered necessary to establish more formal reviews that focused on reviewing the videos to make sure that they were correct before being published at the unit. The following review was intended to be a certification review, but turned into a lively discussion on how difficult it is to use the humidifier. Having watched the video, the following discussion takes place:

Marie: I want to question that we have to control that it’s not leaking when we change [tubes]. It’s really hard work if you simply change the tubes and ventilate by hand...

Catarina: But you also need to clean the expiration valve, not only the tubes, and if you change the expiration valve you have to perform a new control.

Marie: Why do you need to change that one then?

Margareta: Because there is moisture in that as well.

Marie: Is there?

Margareta: More germs will grow when it’s moist. It will grow more (germs) when there is moisture.

Catarina: I think that’s a recommendation from the manufacturer.

Margareta: It’s not in the manual, we have to test it ourselves then.

Birgitta: It’s a typical environment where it can grow.

Margareta: Yes and that’s probably the reason you change the whole set after three days. It is because it grows at that temperature. If it grows there it can grow down there as well.

Einar: This can be an explanation why you have to do it in such a complicated way.

Marie, a nurse, questions why they have to disconnect the patients form the respirator and temporarily connect them to another respirator. Temporarily changing respirators is especially cumbersome because of where the wall outlets of respirators are positioned as well as because some of the rooms are almost too small to accommodate two respirators. She therefore raises the question whether they instead could ventilate by hand the patient and skip moving the patient over to another respirator. The other nurses disagree. Catarina starts by pointing out that not only the tubes need to be cleaned, but also the expiration valve, which in turn requires that a new function control of the respirator be performed. A new functions control in turn cannot be performed if the patient is connected to the respirator and this takes time, which means that ventilating the patient by hand is not an option. The other nurses join in, further pointing out that moisture can grow in other places
than the tubes, which can cause bacterial growth. The senior physician concludes by pointing out that there is no easy way out and that because of the risk of bacterial growth, they will have to continue performing the cleaning of the humidifier in the cumbersome way they currently do. The video is considered good and correct and ready to be released and used in the unit.

The review session according to the nurses was valuable although the discussion lead them to conclude that the activity of humidifying cannot be done differently. The reason it was valuable was that it helped them get a better picture of and arguments for why humidifying has to be done in such a complicated matter. Such arguments can in turn be valuable to have ready when other staff members question the same activity, which frequently is the case. Having a common argument and understanding of the problem, they pointed out, is of high value to not only them, but the whole unit.

The video, although made as a demonstration and reminder of a day-to-day work task, in this instance, becomes a scenario of a cumbersome work activity, which in turn engenders a discussion on how difficult it currently is to perform the activity of humidifying. The instruction is in many ways a simplifications of what it means to humidify. It does not show how messy it is to clean the humidifier by changing to temporary respirators. However, even though the video itself does not show the complexity of the work, it functions well as a rich reification that brings about reflection about their practice. The video does not need to be fully realistic because the nurses when watching it use their shared experience of practice as a resource which stretches beyond the contents of the video. This is in line with Messeter (2000) who argues that simplified problem scenarios for process operators work well as focal points for discussing their practice, because it takes advantage of the fact that the operators have a shared experience of their practice which complements and makes the simplified scenarios both believable and useful. That video works well as a focal point or common frame for reflection, has also been emphasized by Buur et al (2000) where the viewers gain insight into each other’s skills in
their use of ‘documenting’ work practices for purposes of research. Furthermore, Karasti brings some possible explanations of why collaborative viewing of video of work practice works well to facilitate reflection. According to her, when reviewing videos, the staff members are not engaged in carrying out the task. Being disconnected from the task creates an analytical distance to the routine of performing it. But at the same time the videos help them to revive their experiences of performing the work. According to Karasti this distanced revitalization enables aspect that are taken for granted to be seen in a new light (Karasti 1997).

5.4.2 Using self-produced video to explore future changes in the practice

The formal video review sessions were not only valuable in creating common articulations of specific work activities, but became in some instances an opportunity to facilitate the discussion across competences and engendered changes in aspects of their practice. Preceding a film presentation, one of the unit’s physiotherapists had voiced the need to buy a different machine for running CPAP (Continuous Positive Airwave Pressure) ventilatory support, without getting much response from the senior physician. She had voiced the need because the other model was less complicated to use. Having seen the video, the senior physician recognizes how complicated the handling of the current CPAP machine actually is. He wonders if there are not easier machines and if it would not be simpler to run the CPAP treatments on the respirator. The physiotherapist agrees that certain procedures are more easily done on the respirator, pointing out that changing the resistance is more easily regulated on the respirator since one can increase and decrease the resistance by pushing buttons rather than having to toggle. The nurse in charge of security issues concerning infection wonders if such “home made constructions” are really allowed in these times of regulations coming from the European Union that forbid home made constructions. Thereafter, the physiotherapist takes the opportunity to present the possibility of switching to a VPAP machine that has only a single tube and mask and in which the resistance is regulated with buttons rather than by toggling a control. This leads the nurse in charge of the medical technical equipment to enquire how connecting a humidifier works with it and how it connects to the respirator. The physiotherapist answers that the currently used brand of humidifier (Fisher and Paykel), works with it, but a different brand gives more correct results; leakage is monitored, and so forth. She is, however, unsure how it fits to the VPAP. The senior physician states that this would be good to explore and that the CPAP is so complicated and therefore an invitation to accidents if not used often. The senior
physician then asks the nurse in charge of medical technical equipment what she thinks. She explains that the machine is cumbersome for most of them even though many have become better at handling the machine. The problem is that there still are too many loose parts. The pre-packaged sets, with the heater, have made it a little easier because the parts are all in one place. Before this, it was even worse because many parts would have to be retrieved from many different locations. Despite this, however, the staff is still unsure about whether the mask should be reused, and about the PEEP (Positive Expiratory End Pressure) and how certain parts are connected. These last comments surprise the physiotherapist, but the nurse in charge of medical technical equipment rounds off by stating that the mounting of the tubes is easier now and there is a lesser risk of connecting the wrong tubes to the ventilator. The session ultimately led to the VPAP machine being tested, but the unit ended up deciding to run the treatment on the respirator and stopped using the CPAP machine altogether.

This formal video review session, which like all other such review sessions, was arranged to discuss the adequacy of the video as an instruction document, subsequently became more importantly an opportunity to discuss across competences and professions the activity of giving CPAP treatments. The setting, with a physiotherapist, the senior physician, and the nurses with their individual areas of exper-
tise, allowed for different framings to meet. The physiotherapist with her expertise of the usage of the machine has seen the need for and enquired into the possibility of buying another apparatus, which previously has been met with some resistance. During the review, she gets unexpectedly the opportunity to expose how difficult it actual is to use the CPAP machine. The senior physician, on the other hand, confronted with a video, gains insight into how complicated the mounting is for the physiotherapists and the nurses. This insight triggers him to inquiry into whether there are other safer and simpler ways of performing the treatment. The physiotherapist similarly gains insight from the nurse in charge of the medical technical equipment about the fact that the nurses still are unsure about how to use the mask and about PEEP. The nurse in charge of security issues concerning infection frames the problem slightly differently, viewing the CPAP as an advanced home made construction that might have some legal implication.

The question that for us as designers needs to be raised is what role the video had in this discussion? Did using video in any significant way differ from other documents? Would the discussion have been the same if they had met to discuss a written set of instructions on how to handle the CPAP? An obvious difference is that the video showed a performance of the mounting that made it observable how complicated it is to mount and handle the equipment, while a set of written instructions would be a more idealized description of how the work is to be carried out. Argyris and Schön (1996) discuss the difference between what they call espoused theory and theory-in-use where the former is the idealized version of work that practitioners often refer to when asked what they do and the latter is the often partly tacit version of what they actually do. Getting these two views connected creates a dynamics for reflection and dialog, as Smith (2001) has pointed out and the self-produced videos catch and bring some of the staff members’ theories-in-use to the surface, which make them more comparable with the unit’s espoused theories.

In all of the cases discussed so far of making the videos, the collaborative process of making them have been useful reifications that function as points of reference supporting negotiations of best practices and allowing for different perspectives to come forward. They give meaning to persons with different competences in slightly different ways but still help them work towards common goals and points to focus the communication. The reviewing take advantages of the collaborative potential of collecting diverse experiences and different agendas that can be articulated into new knowledge in the re-framing of their work. The self-produced movies have the potential to support development and articulation of work practices. According to the staff, the movie production also facilitated more discussions, out in the corridors, of important issues compared to when before the project started. In
the videos, understanding about certain work activities is given a “form” or “thing-
ness” similar to Wenger’s term reification. (Wenger 1998) As reifications, they are
portable and persistent. However, as with reifications, they also need a close con-
text and participation to reveal their meaning. The movies will never be “complete”
or function as an independent package of knowledge. Rather, they will always be
incomplete and be a part of an always ongoing living reification participation pro-
cess. A key quality of the movies is their open character where they are considered
meaningful only for a limited period of time and in a particular context where they
balances between more rigid standards and an actual situated performance of com-
community members.

5.5 SUMMARY

The process of making the videos, which we from the start envisioned needed to ef-
cient and technically uncomplicated, instead turned out to be rich opportunities to
collaboratively inquiry into current practices and how they are performed and can
be performed differently. The making of the videos was therefore a collaborative
process where the video in some instances transforms the practice and the practice
transforms the video. These processes of making the videos can in some ways be
seen as a process of convergence where aspects of the practice are made persistent,
transformed into immutable mobiles that can travel within the local practice and be
recontextualized. This process of convergence, these agreements upon how specific
work activities should be reified, inscribed, are however just temporary fixations.
These processes of convergence are “incomplete, unending, and non-unitary” (Berg
1997).

Neither can the videos be seen as having a homogenous function or used only
for a specific logic of meaning making. Rather, in some instances, they can be used
as checklists, reminders, while at other times they function as simplified problem
scenarios that are open-ended focal points that engender different perspective
across competences and professional boundaries to meet. Similarly, the inscribed
logics in the technology, the handheld computer and the videos, cannot be said to
have a once and for all given quality inscribed or only generate one type of meaning
making. The screen size, a form of inscriptions, for example, functions well when
used alone, while causes to some degree, in some instances, problems when used
collaboratively. Similarly, the sound, in some instances is non-problematic, while in
other situations, it explicitly signals that you are in need of a checklist or reminder
as well as disturbs other’s work activities.
Throughout the project what meaning making should be put into play and how that could be materially configured has changed considerably; where both tools and practice(s) have been transformed. From envisioning learning aides that would function just-in-time, just-in the right location, the meaning making practice that was agreed on was that the videos should be checklists or reminders. Similarly from the start it was envisioned that the video could be pinned down to a specific location, but was transformed into a material configuration that was more flexibly accommodating different needs. It evolved into preparation as well as a usage of the videos in direct relation to the activities performed. In other words, the meaning making envisioned at first was that knowing could be pinned down to a specific location, while the practice showed that this was not the case. Finally, the practice of making the videos was transformed. To begin with, the meaning making envisioned was that it should be efficient and technically simple, but this was transformed into a collaborative meaning making process where aspects of the practice could be articulated and critiqued. In other words, efficiency was replaced by establishing spaces for learning where the staff got the opportunity to critically reflect upon their own practices through reifications in close relation to participation.
The focus in the previous chapter was on the making and using of “best practice” videos. These videos were made by a specific community for enhancement of learning within the confines of their practice. In this chapter I will turn to design experiments that focus on how technology and self-produced rich media can strengthen the collaboration that occurs in the partnership between patients and health care professionals. As such, the project discussed here is similar to the previous project in that it focuses on self-produced media within a professional practice. However, it sets into play two distinct communities of practice—that of a health-care practice and the everyday practice of being a patient. The focus is thus not on meaning making within a community of practice, but across two very distinct practices. The goal of meaning making within this context is more temporary. Because of this temporary nature, the process of how the rich media documents are made and the final form they take are different from those produced by a single community of practice. In turn, the rich media documents produced in this setting affect the day-to-day work of the health-care professionals.

The same analytical focus will be applied in this chapter. I will focus on how tools and practices converge and recursively transform each other. I will describe the meaning making that is put into play, and how it is materially configured. The technologies explored, be it DVD cameras, screen capturing devices, information
and instruction films stored on video cassettes, CD-ROM’s or DVD’s which are given to patients, are not neutral and value free; values, power, and hierarchies are inscribed in them. The values that are embedded within new systems, applications, and services need to be clarified, negotiated and reconfigured. This is a technical as well as social process—a socio-technical process—where both practice and technology are given shape. The exploration of these reconfigurations of practice and tools demand, as Wagner argues, that we carefully study “the affordances and limitation of both media—the physical and the digital—with respect to human interaction in general, and the reporting and evaluation of medical information in particular” (Wagner 2004, p. 4). New technologies and new mediated spaces change tasks.

The chapter begins by discussing three sets of experiments on individualized patient information and instruction videos. These videos were made in the day-to-day treatment and rehabilitation of patient and health care professional teams. In the first experiment, the meaning making envisioned is aimed at providing re-inforcement of the training provided to patients by physiotherapists. With this experiment, the individualized explanations and guidance on how to perform the exercises provided to the patients can exceed both space and time by following the patient into his or her home. In the second experiment, a similar exercise is set up at an outpatient ward where individualized wound dressing videos were created and we studied whether they would support patients in their self-treatment. The third set of experiments study whether verbally and graphically annotated X-ray pictures can help patients get a better understanding of their forthcoming treatment options when they are faced with the decision of whether to pursue surgery and rehabilitation.

The second part of the chapter discusses how the making of the videos relates to the ongoing work at the rehabilitation ward and the outpatient ward. Firstly, I discuss how the configuration of producing the media relate to the immediate as well as more peripheral activities; in other words the already present social and material configurations. Secondly, I discuss my finding that the documents made by the physiotherapists and surgeons, although similar, are perceived by these two different professions to be somewhat different. The documents produced at the outpatient ward are highly private accounts, while the videos made at the rehabilitation are not seen to contain as sensitive and private issues. In relation to this I argue that it is important both for patients and health care professionals to know and make visible what network of relations the documents produced belong to. Where the documents travel needs to be made transparent and visible to both parties. The chapter ends by discussing how making and finalizing the films standardizes ways of performing work, which in turn affects the flow of work and the coordinating
of tasks. These material standards, of making the camera ready, of recording, and finalizing the films, also affect how different professions are enclosed and grouped. Issues are raised on the roles the different groups need to take in production of the films.

6.1 EXPERIMENTS WITH MAKING INDIVIDUALIZED PATIENT REHABILITATION VIDEOS

The project partners early on decided that a potentially meaningful area to explore was the collaborative meaning making between patients and health care professionals already present in the day-to-day activities. We aimed at strengthening the collaboration between health care professionals and their patients by the production of rich media.

The meaning making we wanted to explore and put into play was whether patients’ rehabilitation could be facilitated by capturing instances of their interaction with the physiotherapists when learning to exercise their hands and finger, which could in turn contribute to the patients meaning making at home when performing the exercises. We wanted to explore whether a patient could be helped with being given rich media documents that could in a sense stretch out the rehabilitation session and facilitate the transition from performing the exercises at the rehabilitation clinic to performing the same exercises at home.

We were interested in how these documents should be materially configured in terms of both their technical production and content. Where would the camera be positioned, who would control the recording, how would the video be edited? Should it be divided into chapters and if so can that be done on the fly with a pedal to stop and restart the recording? How does it fit into the existing structure of performing the work and in what way does it restructure the physiotherapists work? Would the patients need various formats, such as video cassettes, DVD’s and CD ROM’s and if so how would that affect the production? Regarding the content we needed to see if non-personalized videos focusing on certain patient categories would suffice or whether personalized video would be more useful and worth the effort. Would the quality be good enough for the patients and would it be relevant to for the patients and their concerns and needs?

The issues of material configurations are highly related to what type of meaning making is put into play. Any chosen rationale will yield different possibilities, consequences and constraints that will ultimately affect what meaning making will be put into play. Turning the rehabilitation session into a recording session might
alter what is said, how it is said and in what order things are said. Who controls the recording similarly might affect what and whose meaning making is put into play. In these experiments we focused on the healthcare professional as the main generator of meaning making, although the patients’ participation in articulating concerns and needs are considered and essential to the practice.

To explore the potential of “stretching out” the rehabilitation sessions, three experiments were carried out with one of the physiotherapists at the rehabilitation ward. Three patients in need of training instructions were selected and asked to participate in this study. The video recording was done in one of the physiotherapist’s

**Figure 44:**
To explore if the rehabilitation session could be stretched out patients where given individualize rehabilitation video instructions.

treatment rooms, where the door could be closed for privacy. The physiotherapist pointed out that it would be unnecessary to record the whole session and that it would suffice to record the portions where he explained to each patient the status of their injury and the recommended rehabilitation exercises. Generally, physiotherapy sessions take place around a small mobile table but also requires the physiotherapist and patient to walk to a large poster a few meters away with illustrations of hand anatomy which helps explain to patients the scope of their injury. For the purpose of our study, in order for the camera with its zoom lens to stay in its fixed position on a tripod, the poster was placed next to the table so that the physiotherapist could easily pick it up and position it so that it was visible within the recording field. The camera was connected to a laptop computer, where the recorded video could be transferred and directly burned on to a CD-ROM or a DVD.

Our study found that individualized videos, rather than generalized ones, were preferable. The three recorded sessions each provided a record of the physiotherapist’s explanations and instructions to the patients. However, because of the diversity of injury, each patient had different requirements and concerns which demanded individualized specific explanations and instructions on physical rehabilitation exercises. For example, when discussing the status of a particular hand injury, what was said was always in direct reference to a particular patient’s profession. More
specifically, a professional soccer player has specific concerns in regards to when he might start training and what type of training he could start with in relation to the status of his injured finger. Similarly, during the instructional part of the session, the patients could raise issues that needed individualized answers. A patient’s concerns about his or her particular symptoms, such as a stinging sensation and pain in the injured finger, need specific type of coaching. This is illustrated in the following dialogue where an anxious patient expresses concern about performing a particular exercise:

Patient: Now is time for the worst exercise.
Physiotherapist: It’s no problem, just bend the finger and hold still.
Patient: I’m almost too afraid to touch it.
Physiotherapist: It’s not a problem when you are relaxed—when you are relaxed there are no muscles actively pulling the tendon.

Understanding that the patient is anxious and noting that the next step in the exercise distresses the patient, the physiotherapist takes the time to calm the patient. He emphasizes, more than with the other patients, that passively exercising the finger does not hurt as much as when actively exercising it because during a passive exercise no muscles are actively pulling the tendon and causing pain. This individualized and specific meaning making thus is more successful in dealing with each patient’s individual concerns.

The three patients received their individual fifteen minute long training sessions on CD-ROM’s, with the exception of the professional athlete who also was given a tablet-pc where a copy of the video was stored. The patients were all willing participants and had positive outlooks in regards being able to review their videos once or twice. One of them stated that the training sessions were fairly simple and would not be difficult to perform. She felt that the video was a good idea, but perhaps more relevant for elderly people who might have a hard time remembering their training sessions.

When interviewing the patients upon their next visit to the rehabilitation ward, all of them had found the videos highly useful for performing the exercises at home, for communicating to relatives and friends about their injury, and as a point of reference to how they progressed in their treatment.

On a practical level, the patients could easily navigate the video with the media player in their personal desktop computers. Furthermore, one of the patients who owned a laptop computer expressed the ability to more freely decide where to view the video, especially when performing the exercises with a more readily mobile
computer. Similarly the same patient who had been given the tablet pc found having the videos readily available on a mobile platform useful and encouraged him to bring the video to work. He was able to show the video to his soccer team’s physiotherapist. (Obviously he just as well could have used his own laptop).

From the patients’ perspective, dividing the video into chapters seemed to be unnecessary, which points out that the production from their perspective can be kept fairly simple. The angle of the recordings, worked also fairly well although in some instances it would have been preferable to have closer shots of the hand and fingers.

The patients, although at first somewhat reluctant, found the videos useful memory aids when performing the exercises as well as lessening their insecurity when performing the exercises at home. When it came to using the videos as exercise instructions, two of the patient found it sufficient to use the video twice, while the careful and insecure patient used it every time he had felt unsure and as such watched the video fifteen times. Although the videos were each fifteen minutes long, none of them had found them tedious nor did they feel that the videos needed to be more succinct. Two of the patients watched the instructional part of the video prior to doing the exercises, while the insecure patient performed his exercises at the same pace as shown in the video, which he would play back simultaneously as he performed the exercises. Part of the explanation why the videos were found to
be useful support when doing the exercises at home can be found in the following comments:

Patient 1: When you first meet the people in the hospital, you are under stress, you think you will remember all the instructions but you won’t, really. When you watch the video at home, you are more relaxed when you hear Fredrik say that there is no danger with the passive movements and that it would not cause injury…. Positive definitely, it feels good that it’s me doing it, it feels personal; it’s me and my fingers.

Patient 2: When you sit there the first time and get the instructions, you can get caught up by a detail and miss the rest. When I reviewed the video, there were many aspects that were new to me and I wondered whether he [the physiotherapist] had said that as well.

The two patients found it is difficult to remember all the details that had been communicated during their sessions. The first patient points out that the difficulty of remembering was due to the stress experienced at the beginning of the treatment process. The second patient points out that the he was so concentrated in getting certain details right that he missed other details, which he was not aware of prior to viewing his video. The first patient further points out that it was less stressful at home and having the video helped him relax when performing the exercises alone. One of the factors that allowed him to be more relaxed is that the individualized video was targeted at his personal concerns, i.e. performing passive exercises would cause no harm to his injury. Furthermore, his sense of security was helped by the fact that the video was made with a trusted physiotherapist that he knew personally. Seeing his own fingers in the video made it personal and therefore more relevant and this motivated him to follow the instructions more closely compared to what he would have experienced with a generalized non-personal instruction video.

The feedback from the patients verified positively our assumptions. The videos gave the patients a record of the rehabilitation session and helped them remember the details of the exercises. Having the personal videos with them at home strengthened their sense of security making them feel more comfortable in performing the exercises and to some degree motivating them in their rehabilitation. The meaning making accomplished here was a better informed, more secure, and more motivated patient. The professional know-how and calm of a rehabilitation ward traveled with the patient into his or her home.

However, we did not anticipate that the patients would use the videos as a reference point that enhanced communication between themselves and their physio-
therapists as well as relatives, friends and colleagues. Two of the patients pointed out that they had used the videos as a reference point; comparing their current state with the recordings. The video recordings showed their progression or deterioration more visibly. One of the patients, when meeting with another physiotherapist at the clinic, used the video to show that the range of motion of his finger had deteriorated since the last consultation. When using the videos to communicate with relatives and friends, the patients pointed out that it helped them in describing a more precise picture of their injury. The physiotherapist’s explanations of the status of their injury were useful and appreciated and, as one of the patient said, ‘benefited the whole family.’

The patients redefined the video as not only being one-way information from the physiotherapist, but also as an instrument for making visible their treatment and as a tool for them to explain their injuries to others. The videos allowed the patients to review their progress and helped them communicate to others even though initially they were conceived as artifacts that would communicate directly only to the patients.

The meaning making we wanted to put into play from the beginning with individualized video instructions was first of all to strengthen the physiotherapist’s teaching and coaching. The goal was to help the physiotherapist communicate more effectively the status of a patient’s hand injury as well, and more importantly, improve the patient’s ability to perform their rehabilitation exercises. In other words, the video artifact could be seen as an instrument to reconfigure the patient-physiotherapist relationship into a more controlling relationship, where the minute descriptions of how to perform a particular exercise follows the patients into their private spaces at home. Further it could be argued critically that having the videos take away the patients’ opportunity to reinterpret and retell what it means to be injured.

We have made the experiments on the assumption that patients seek professional help precisely in order to be taught and coached, even taken care of. Therefore, the videos are tools in enhancing the partnership between physiotherapist and patient rather than mere instruments which curb the patient’s freedom of expression or interpretation. The patients’ reactions have all been positive and none of them have felt more controlled or disciplined or that their own personal voice and accounts of their injury have been diminished. Instead they have expressed that the videos help them perform the exercises and communicate more fully to others about their injury. At the same time, although personally configured for each patient, there is no guarantee that all videos produced in a similar way will be found useful or empowering by all. As Star (1991) points out, there are no configurations, however tailored to special needs, which are at all times and for all liberating.
6.2 DRESSING A WOUND WITH THE SUPPORT OF A VIDEO INSTRUCTION

Although we were unable to observe the patients participating in the experiment at the rehabilitation unit in their homes, we got the opportunity to observe another patient in his home who participated in an experiment at the outpatient ward. This experiment clearly showed that individualized video helps to make the transition from the clinic to the home and self-treatment less insecure. It also showed that professional discernment and dialogue with a patient is needed in order to clarify the instructions which will be given to particular patients. There is a tricky balance that needs to be found on the timing and the degree of self-care that can be undertaken by patients. Furthermore, this experiment deepens our understanding of how video can facilitate hand surgery patient in communicating with relatives and friend about their injury.

The patient we will now look at had eight days prior to our experiment cut the tip of one of his fingers in a work related accident. His wound had been dressed at the outpatient ward five times. The worst pain had subsided and the patient felt ready to dress the wound on his own. Together with a nurse, we made a video of how the patient’s injury was dressed and bandaged. The patient was given this
four minute long video, which shows in detail how a dressing and bandaging of the finger is performed.

The patient, when performing dressing and bandaging on his own for the first time with the video, sat in the sofa in his living room with the living room table in front of him where he had placed the dressings, bandages, scissors and the remote control to the DVD-player. The instructions were clearly visible, although the television facing him across the table was about four meters away. This physical set-up should be compared to the patient’s desktop home computer, which was crammed in the corner in the adjacent room with little or no table space.

When dressing and bandaging the wound with the help of the video, the patient played short sequences which allowed him to perform each sequence of the dressing after pausing the video at each step of the procedure. He paused the video after the nurse had shown how the dressing should be cut, again after the nurse had shown which part was paper and which was the real dressing. He also watched two sequences without pausing - how the Steri-strip is taped over the inner dressing and a meshed dressing is wrapped around the finger. This required him to rewind the video to the appropriate sequence after he had accomplished the tasks. There were sequences that he found particularly difficult, such as the wrapping of the soft and elastic bandages, which required him to watch those sequences of the video twice. The last moment in the video, where the nurse ensures that he can flex his fingers, he performed almost in synch with the video and exclaimed: “Perfect!”

Following the video worked well and the patient was pleased with the result. Having to pause and rewind was not seen as a problem even though at times it meant letting it roll, which in turn meant that he needed to rewind the video to return to the last seen sequence. In fact, being able to pause and rewind as needed was seen as a quality which allowed him to perform the dressing and bandaging at his own pace. The physical set up; the distance from the television and table worked well although other types of mediating technologies might be useful to explore. The nurse inspecting the dressing and bandaging during the next consultation at the outpatient ward was also pleased and thought that the patient had done an excellent job. The patient therefore continued to bandage his finger four subsequent times using the video as a reminder of the procedure. The one time where he did not use the video, he expressed that he did not achieve as a good a result with the dressing and bandaging.

The video documentation of the patient’s use of the training video clearly shows the patient’s need to follow the instructions in detail taking one small step at a time. Even though physicians questioned the need to follow every step of the dressing sequence during the film review, the patient’s need to carefully follow the presented
instructions is understandable in light of the fact that this was the first time that he performed the procedure on his own and that he was not accustomed to the dressing of wounds. Faced with a new situation, it was better to be on the safe side, and imitate in detail the nurse’s actions. The patient was not “medically literate” and was thus not aware of whether performing the dressing in a different way would have negative consequences or not.

Caring for your own injury is a new and unfamiliar situation. Even though it occurs within the confines of home, it can be stressful and a cause of insecurity. After having bandaged his finger with the video, the patient stated that without the video he would have been “a lot more hesitant in my acting; towards the finger.” He doubted that he could have bandaged the finger on his own without the aid of the video. Perhaps he could have tried bandaging his injury if he had been given written instructions, but having the video was probably a more useful tool since he could see the dressing sequence in real time with his own eyes and because he could pause and rewind as he pleased. He felt that written instructions might have been effective but would not have been applicable to his very particular injury. He says, “I feel more secure when I have the video; I am a lot more secure in my acting regarding the finger, so to speak.”

Having the video in this case seems to have allowed the placement of the consultation in the patient’s home. Part of the professional know-how and calm seems to have traveled through the mediated technology and as such was placed in a new setting where the patient would not have felt secure in providing himself self-care. The substitution of a real consultation with a mediated consultation cannot be categorical determined in advance. It is far from certain that all patients facing a similar treatment could or would want to take on a more active role in their self-care. Also, at what time the patients should or could be given video instruction on self-care needs to be negotiated between the healthcare professional and patient.

When asked if he could have, with the aid of the video, started dressing and bandaging on his own earlier in the treatment, the patient stated that he could have started after the previous session if given a video instruction, “but if it had been during the first week after it happened I could not have managed, because then it was too painful - I would not have wanted to touch my finger.” Deciding at what time a patient should be given a film is therefore difficult to know in advance. The nurse’s experience with care of patients in similar situations, just as the patient had pointed out, is that the first few days after an injury, patients need to be treated at the clinic. If the service of providing patients with individualized video instructions on self-care should be made available, it is important that it be provided on the patients’ term, in a dialogue with the patients about how ready they are with taking
over their care. Forcing the service prematurely on patients to decrease direct clinical consultation with a healthcare professional, even though it might appear to help with decreasing overall cost from a healthcare administrative perspective would be detrimental. And as Henwood et al (2003) has pointed out some patients are not interested in taking a greater responsibility in their treatment.

As with the patients in the experiments at the rehabilitation ward, this patient also used the video to give his relatives and friends a better insight into the scope and state of his injury. He reported that he showed the video to near relatives and friends the same day it was made for him in the outpatient ward. His friends and relatives were constantly inquiring into the scope of his injury. And even though he would explain to them how it looked like, some would tend to envision that his finger was more injured than it actually was. For this patient, as we also have seen with other patients, being a patient means not only dealing with the physical sides of the injury, but also negotiating how it affects and potentially alters their identity. In particular, this is defined partly at least through the social relations that he is engaged in.

Within the time frame of our study, we were only able to stage one such experiment. Further study needs to be done to assess individual differences between patients are large enough to warrant individualized videos or whether more general video might suffice for this kind of treatment. However, from a (learning) motivational perspective, it is perhaps not unessential that a patient sees his or her own hand in the video which also involves a nurse that he or she has had an established relationship with. Having a generalized video with another patient’s hand, with perhaps a slightly different dressing, and perhaps an unknown nurse would be a different form of reification in participation (Wenger 1998) and a different motivational framing. And as Säljö (2000) points out, which social framing set into play affects the motivation of the learner and the quality of the learning outcomes. Furthermore, a generalized video would not allow the patient to use the video to make visible the scope and state of his particular injury to relatives and friends, which in all the experiments including this one has been an important quality.

6.3 EXPERIMENTS WITH ANNOTATED X-RAY FILMS

Patients who require elective surgery are a considerable part of the hand surgery clinic’s patient population. Patients with rheumatism, degenerative joint disease causing worn out cartilage in the joints of their hands, and so on, come to the clinic to have their ailment or injury diagnosed and treated. During the first consulta-
tions, a patient’s ailment is assessed in dialogue with the hand surgeon and recommendations are given to the patient on the course of treatment they should take together. Certain diseases and injuries require careful consideration to be given to the pros and cons of possible surgical intervention. For example, injuries of the thumb base and Dupuytrens contractures in the hand are two typical diagnoses where the ultimate positive outcome of surgery cannot be guaranteed in advance. Surgery in the later case can increase the contractures a risk the patient needs to take into consideration before deciding on going forward with an operative intervention.

In this setting, our experiment focused on whether documentation of a patient’s consultation with the hand surgeon could be an aid in helping him in the decision process. The documentation of the consultation would again help the patient to remember in more detail the different risks and benefits of the proposed procedure. This would in turn facilitate their decision-making on whether to go through with the proposed treatment. We wanted to study whether video documentation of a consultation could be of value in the collaborative articulation of a particular disease and enhance the process of deciding on whether to go forward with a proposed solution to treat the disease.

In order to study the possibility and benefit of making a video record during a patient’s early consultations with the hand surgeon at the outpatient ward, an experiment was set up where a patient consultation was recorded. (The patient, although willing to participate in the study, did not allow us to use the video and account for its content in our experiment and it is therefore generally described here without details).

The consultation between the hand surgeon and the patient took place for the most part at the consultation table where the patient and surgeon sat facing each other. This was easily recorded with a stationary DV-camera. Part of the consultation required both the surgeon and patient to stand up and study X-rays clipped to a nearby light box. The consultation lasted about fifteen minutes and was recorded on a DV-camera and transformed into a VHS cassette, because the patient did not have a computer or a DVD player at home.

During the consultation, the surgeon asked the patient how the ailment affected the patient’s daily life. An assessment was also made of the disease with physical examination. The surgeon having a good picture of the patient’s physiological and social situation explained the pros and cons of the surgery and how the treatment and rehabilitation would affect the patient’s life in the long and short term. At the end of the consultation, the surgeon recommended that the patient think over the matter since it was not a given that the patient should pursue surgery and it was proposed she return at a later time. The patient thought it was highly valuable to
have the visit documented. This video documentation gave her the opportunity to review the consultation at home in peace and quite and consult with relatives. This experiment showed that it was valuable for patients to receive individualized videos during an early consultation as a memory aid and for supporting the patient in deciding whether to go through with a proposed treatment.

Our experience with video recording at an early consultation showed that although valuable for the patients, it might be too demanding for the surgeons. This is because the consultations are more open-ended dialogues early in the treatment process. We wanted to alternative ways of catching the in situ dialogue between surgeon and patient. Initially, we played with the idea, which had come up during one of the workshops, that patient could be given an Anoto animation where the surgeons could draw on an Anoto paper and simultaneously explains the status of the hand and what treatments might be recommended. The recording, the drawn animations and verbal explanations, would thereafter be given to the patient to view at home. However, after discussion with one of the surgeons, it was decided that a more feasible course to explore was for the surgeons to draw directly on the digital X-rays and that the discussion that took place during the consultation between the patient and surgeon be recorded and given to the patient on a portable storage medium such as a CD-ROM. The surgeon felt that using the X-rays, which have the right scale, would be more accurate than drawing on an Anoto paper.

A second set of experiments were therefore set up together with the surgeons exploring if it would be useful for the patients to receive annotated X-ray movies, which could be given to the patients and used as an aid in their decision-making process. Other questions that we wanted explore could be addressed by this experiment. Could such recordings be relevant for other purposes such as documentation of ongoing treatments? How individualized are the patient’s concerns? In what way would this alternative way of capturing the consultation differ from video recording the consultation? Would it to the same extent capture the dialogue between the

Figure 47: A surgeon, patient and the patient’s mother conversing about a digital X-ray of the patient’s injury.
patient and surgeon? Could it more easily take advantage of the configuration of the consultation or would it miss essential parts performed elsewhere? Simultaneously we were interested in seeing if it would be possible from the surgeons’ perspective to integrate such a moment into the already hectic and tightly scheduled workflow of the outpatient ward.

Two surgeons who had many “X-ray patients” participated in this set of experiments. Off-the-shelf screen capture software was installed on two computers and microphones were placed on the table in two consultation rooms. Patients judged to be pertinent to our study by the surgeons were asked if they wanted to participate. Just as in the previous “early consultation experiment,” most of the consultation was limited to the consultation table where part of the discussion was carried out on digital X-rays. The computer screen displaying the X-rays hung on the wall above the consultation table between the patients and the surgeons. Both the surgeon and patient had easy access to this screen. The researchers were present during the experiments. They put CD-ROM’s in the computer, which is inaccessibly placed under the table on the patient’s side of the consultation table, prior to the consultation. Furthermore, the researchers assisted the surgeons in handling the software, producing the movies and burning them on a CD-ROM.

The twelve movies made in this manner and given to the patients ended up being between two and three minutes long. Many of the sessions recorded turned out to be “straight forward treatments” and ongoing treatments, rather than difficult.
cases where the patients would need to consider at home what course of treatment they would want to pursue. These movies were, nevertheless, found useful because they gave the patients a picture of the forthcoming treatment or the status of an ongoing treatment. Regarding receiving documentation of ongoing treatment, one of the patients stated that “at times you can misunderstand the doctor and then it can be good to go back and listen to what he said; hearing what he meant in actuality.”

Having a summary of the consultation gave the patient the ability to clarify uncertainties that he or she might have. Regarding receiving individualized documentation of forthcoming treatment, another patient that we interviewed while awaiting surgery, found that although general medical explanations were helpful in giving him a picture of the forthcoming treatment, it would be more helpful to have more specific information such as the expected length of the sick leave he would need to take as well as more generalized information about the frequency of the particular injury that he was suffering from. He felt that a combination of individual and general information was best. He emphasized that just receiving general patient information would not be as interesting and useful. Furthermore, the patient, as several other patients also pointed out, the video helped him give relatives and friends a better picture of his injury and he planned to watch the movie again just prior to being enrolled to remind him of what had been decided upon.

The consultations sessions pointed out that individualized movies were relevant even for patients where the treatment process was given or ongoing. Although these patients belonged to the same patient category required considerably different forms of treatment. For example, five of the patients who participated in our experiment had scaphoid fractures, a complex and difficult fracture of a bone in the wrist. All of these patients required different treatments for their scaphoid fractures. Patient A had a fracture across the scaphoid and a loose fragment sticking out from the bone. The recommended treatment was six to ten weeks in a cast, and the status of his fracture repair needed to be re-evaluated with a CT examination after six weeks. Patient B had a scaphoid fracture and surrounding hematoma between the scaphoid and an adjacent bone, which needed to be treated with cast immobilization. Patient C had a scaphoid fracture that had already been treated with a cast and was healing well. However, the scaphoid itself was grinding against the radius, a bone of the forearm. This grinding between the two bones needed to be dealt with after the scaphoid fracture had completely healed through an arthroscopic operation where part of the radius would be milled down. Patient D had a chronic fracture and a cyst in the scaphoid. The cyst needed to be removed and the ensuing defect needed to be replaced with a wedge of bone graft which would be taken from the hipbone. This graft and the scaphoid in turn needed to be stabilized by driving a
Herbert screw through it—the configuration of this particular screw compresses the bone fragments together at the fracture interface and thus considerably decreases the length of time the patient would need to be immobilized with a cast.

Because of the myriad treatment options needed to treat a specific injury such as a scaphoid fracture, individualized videos would be more beneficial and relevant to patients rather than generalized movies about the injury.

Many of the movies produced which concerned the course of treatment that had already been given, had a tendency to become summaries of the patients’ status and the course of treatment that was to be followed. In these documents, the dialogue between the patients and the surgeons disappeared. Even though the consultation contained this dialogue, it could not be translated into the movies. Also, many of the recordings tended to focus on the technical aspects of the forthcoming treatment, describing, for instance, in detail, the function of a specific screw, rather than describing how the treatment would affect the patient in the long and short term. The movies thus tended to be less of a collaborative meaning making process compared to the video recordings of the complete consultations. Despite this finding, some of the recordings did mirror the collaborative articulation of a problem during which technical aspects of a treatment protocol as well as patient-centered issues were both addressed.

Two of the consultations we recorded concerned patients where the course of the treatment was not clear cut. These recordings were highly dialogue oriented and the consultants spent considerable amounts of time addressing the patients’ concerns. I will now describe in detail one of these consultations. It involves a twenty year old man who had an injury that did not have a clear cut prognosis. It was unclear whether he should go forward with another operation that might increase the mobility of his wrist and forearm.

Towards the end of the consultation, while sitting at the consultation table facing the patient, the surgeon starts the screen capture software and begins to draw on the patient’s X-ray and explains the status of the injured hand. He notes on the X-ray where the patient’s wrist had decreased range of motion and explains that it is partly due to calcifications from the injury repair and partly because of two tight ligaments constricting wrist movement. He thereafter explains, while simultaneously drawing, that the plan is to stretch these two ligaments with a frame that is fastened to the bones with four screws.

In this instance, the surgeon being in charge of the social framing sets the stage and decides at what point that the recording should start and in what order issues will be addressed. As with most consultations, the recording starts with the surgeon’s diagnosis of the hand injury. Having given his assessment of the hand,
the surgeon then explains the proposed plan. The surgeon speaks with authority and certainty about the proposed operation. The patient listens and confirms that he understands the explanations and appears to accept his role as a novice who has come to consult with an expert.

Having heard the surgeon’s diagnosis and planned course of treatment, the patient asks the surgeon if the treatment will also increase the lateral mobility of the wrist. The surgeon answers that the treatment would only increase the “up and down” (flexion/extension) mobility of the wrist. He suggests that the patient should go home and think over the matter and ends by stating that ...”It will never become completely normal, that I can promise you... I cannot promise you how much better it can become; it should become a little better.”

In this instance the patient perceiving that the surgeon has given him sufficient background on his status and possible course of treatment he becomes more actively involved. He inquires to what degree the treatment will increase the mobility of his wrist, what he will gain from the treatment, how it will affect his life quality in the long run. The surgeon explains that it will only increase the “up and down”- and not the sideways mobility. This statement is a promise which the surgeon directly modifies by stating that the patient should not expect too much. The wrist, he explains, will only get slightly better; never completely normal. The surgeon is very circumspect when giving the patient promises.

The surgeon means to end the session, but the patient becomes even more assertive and starts to inquire into whether the treatment entails some risks and requests specific explanations on how the ligaments are stretched; whether he or the surgeon would stretch the frame. The surgeon answers that there are always risk involved when performing surgery. Infections around the pins could occur, but that can easily be treated with antibiotics. The surgeon further points out that stretching will cause pain and he will require pain killers. Lastly, the surgeon explains that the patient will have to come to the clinic once a week for inspection and for tightening the nuts on the frame.

In this scenario, the surgeon being in charge of the consultation decides to end the session, but from the patient’s perspective there are still some issues that need to be addressed. The surgeon, although in charge, is keen on listening to the patient’s concerns and lets the recording continue. The patient, given the opportunity, inquires further into what the treatment will entail both in the long run and the short run. The surgeon weighs what problems may occur with how they can be addressed; pointing out the risks a surgery might entail while at the same time judges them to be slight. He further points out that the treatment will cause considerable pain. He reassures the patient that his team is dedicated to minimizing the patient’s
pain. The surgeon gives the patient an optimistic picture of what the treatment will entail without glossing over possible difficulties - namely the risks of infection and the involved pain. He is at the same time keen to balance these difficulties by explaining that these matters can be dealt with effectively. Lastly he explains to the patient that he will receive good care of by the clinic. There will be regular meetings between the patient and the healthcare team and their trained professional judgment would help guide him in the decision-making process.

The meaning making in this session is thus the result of a joint process of expressing and negotiating ideas – in this case what it means to go through a treatment and if the proposed treatment is worth pursuing. This joint process is done partly through a shared forum, which consists of the dialogue and the drawing. By drawing the frame and the screws and verbally explaining the procedure to the patient, the surgeon aims at mediating what the problem is and what it entails to increase the mobility in the wrist. The X-ray and drawing themselves, although correctly scaled are a simplifications of what it means to have four screws and a frame attached to the arm. They are in no way representative of what it will mean for the patient to wear the frame and have his hand stretched for many weeks. This reification, however, seems to function well in situations of close participation (Wenger 1998) where worries are weathered and given answers.

In one sense the surgeon, by drawing and explaining to the patient, is taking notes for the patient. Ackerman argued, during a seminar at the Space & Virtuality studio, Malmö in 2001, that taking notes and building shared objects-to-think with, or in other words shared forms, are valuable resources for keeping track of events, for mediating exchange, and freezing ephemeral instances into tangible episodes that can be visted anew, reorganized, and recomposed. These drawings and verbal explanations are revisited and recomposed by the patient during the meeting. When he returns to what it means to wear the frame and screws, he verbally ‘redraws’ the problem revealing what he has understood and what he has not understood as well as revealing what needs further explaining. The consultation is redirected to the questions of whether the treatment will increase his mobility, whether he will be involved adjusting stretching the frame and whether the surgery might entail risks. This in turn requires that the surgeon verbally “redraw” the picture, giving the patient a deeper understanding of the situation, by adjusting his explanation to the patient’s specific concerns.

Although what roles the patient and surgeon take are defined by social framing (Goffman 1996, Thörnqvist 2001) it does not mean that they are predefined and static, but rather shift depending upon the changing social circumstances. What they communicated about and how it is communicated is adjusted to what happens
during the discussion as well as what has happened during prior communicative activities. The surgeon is clearly in charge and sets the agenda, but at the same time highly open for letting the patient influence the course of action where more patient centered concerns are brought forward.

After this consultation, the patient when contacted a few weeks later, had reviewed the film three times and showed it to his fiancé and her family. The documentation, he thought, was a good way of showing others what type of injury he had and to discuss whether he should go forward with the operation. However, he felt that it would have been even better if he had been given a review of the whole course of treatment and the operations that he had already undertaken since he did not remember much of what had been said to him at the start of the treatment. The film could have been more detailed, for example, the surgeon could have explained how long the operation would take. He further stated that he planned watching the film again before meeting with the surgeon again and that it would help him be better prepared to question the consultant. He stated that often, one doesn’t know what exactly one’s concerns are until after the visit with the physician. He stated that he most likely would not go through with the operation because of the risks of getting an infection and the involved pain. However, he pointed out that he planned on consulting his grandmother on what he should do, because she was a good person to council and gives good advice. This is in line with what Henwood et al. (2003) have observed. They found that patients, although having access to medical information on the Internet, prefer and mostly consult professional healthcare practitioners as well as consult relatives and close friends regarding health issues facing them. In this case, after having consulted with his grandmother the patient decided not to go through with the operation. The surgeon was supportive of his decision and did not think that the X-ray recording had in any way caused problems in his communication with the patient or had a negative influence on his decision.

6.4 MAKING THE MOVIES

The meaning making put into play by producing individualized patient documents has the goal of supporting and strengthening the patients’ learning activities. The meaning making put into play did not in any large degree aim to engender reflection or change in the practice of the healthcare professionals involved. When we asked the staff if and why it would be worth the effort to make the films, they stated that it would be worth the effort if it lead to a more motivated, well-informed, and well-prepared patient. As such I would argue that individualized videos and X-ray movies relate to the core of medical work. They are meant to support and strengthen
the collaborative articulation of the treatments. Wagner raises the issue of “what kind of work other than the work directly related to the clinical care situation can be legitimately expected form health professionals?” (Wagner 2001, p.6). EPR’s (electronic patient records) often demand that health care professionals document more extensively than is needed for managing a patient’s illness, because the EPR’s are accountable to researchers, and healthcare administrators, and thus often have little to do with the practitioners’ or the patients’ immediate needs.

Another reason why it might be worth producing the videos from the staff’s perspective is that they could be used to collaboratively reflect upon their practice and gain insight into each other’s ways of working. During the project, we were able to arrange one film review with the physiotherapists at the clinic. This review allowed the physiotherapist to watch the treatment of a patient by another colleague and thus helped those who participated to gain insight into each other ways of working. This in turn could lead to improved ways of treating the patients. For example, while watching one of the videos it became clear that one of the physiotherapists worked somewhat differently than her other colleagues. She explained her practice to the other physiotherapist which involved filling out a paper form of the course of the rehabilitation at the end of the first visit. She also pointed out that the physiotherapist in the video often asks the patient “how it feels” instead of waiting for the patient’s reaction, which her experience has proven an effective strategy. The video also pointed out to the physiotherapist that he should have been tougher with his patient. In the video he tells the patient to stop bending the finger when it feels taut, which he realizes the patient does almost immediately. Instead it would have been better to ask the patient to bend the finger until it hurts. The reviewing of the videos also engendered a discussion concerning the language used during a rehabilitation session. The physiotherapist in one of the films states that “after four weeks the tendon has healed.” This, his colleagues felt, could give the patient an incorrect picture that the tendon is completely healed after four weeks. During the filmed session it became clear that that was not the case and that the tendon after four weeks could only handle a limited amount of work. The video session thus showed that the physiotherapists have much to gain from keeping some, if not all, the videos to later collaboratively watch and critically reflect on their practice.

But whether or not making the rich media documents are worthwhile depends on how the making can be weaved into the existing structure of work and in what way it restructures the work. We will now turn to how the production of the rich media documents affects the staff’s space of action.
6.4.1 Recording the films

The surgeons, physiotherapists, and nurses who have been involved with the production of the movies have had a positive experience. Integrating the recording into their work did not disturb the flow of their work. None of them found recording the consultations intimidating. The physiotherapists did not, as they had expected, need to restructure their session more clearly into an information part and an exercise part; that more informative aspects were weaved into the instructional part worked well both for the physiotherapist and the patients. The production of the videos, with a digital video camera on a tripod also worked well and did not demand any editing and dividing the video into chapters proved unnecessary.

The nurse felt comfortable with being recorded and did not prepare herself in any way and did not have to change in any large degree how she performed her task. The only minor alteration was that she made sure that she had all the different tools, dressings and bandages she would need and had as well in advance prepared for the bandaging by cutting some of the dressings to the right size. The recording of the video did not demand any retakes or editing afterwards.

The surgeons also found it fairly easy to integrate the recording of the verbally and graphically annotated X-rays into their work. The recording program is ready to use and the surgeons easily started and stopped the recording with three keys on the keyboard. And as one of them explained: the making of the movies was similar to the tasks that he already performed. When talking with the patients he usually draws on the cover of the patient journal map, which he gives to the patient. As such making X-ray movies is just more advanced way of continuing that practice.

6.4.2 Turning the consultations rooms into recording studios

Our experiments point out that if the making of individualized films should become a part of daily practice at the clinic, recording areas, which should be readily available, pre-configured yet adjustable, visible yet undisturbed, need to be established.

When setting up the first experiments at the rehabilitation unit around individualized patient training videos one of the physiotherapists ‘personal’ consultation room was chosen as an appropriate location. The room was somewhat more private and away from the busier and open rooms where multiple activities were going on simultaneously. Furthermore, because the door could be locked the physiotherapists did not feel that they needed to store the camera in a drawer. To be on the safe side, they would put the camera in the corner of the room and cover it with a piece of cloth and lock the door. This configuration of the equipment locked in a room
and stored away and covered up in a corner made it to some degree invisible and unavailable. Unavailable and invisible because the physiotherapists have a tight schedule, where there is no time for setting up the camera in the right location, connect it to the power outlet, set the right angles and load the camera with a recordable DVD. Setting up a recording studio from scratch would be too time-consuming. This invisibility and the fact that the equipment was not readily available decreased the production of the training videos.

Placing the DVD camera in another location, more readily available and more visible, raised the issue of how the recording would be affected by other activities going on in the vicinity. The first location that was tried did not work since it was too close to a corridor. This pathway disturbed the recording sessions as other patients and staff freely entered the recording area. Ultimately, temporary location was found; a place available to all the physiotherapists, clearly visible but in the corner of an open room shared by the physiotherapist and the occupational therapist. Here, the camera had a semi-permanent configuration, the angles of the camera were set so that the correct size of the consultation table would be recorded, the camera was connected to a power outlet, and a DVD placed in the camera.

Similarly, the experiment at the outpatient ward of making the wound dressing instruction video showed that if the nurses were to make the recording on their own, they would need to have a camera connected to a telescopic scissor mechanisms mounted on the wall allowing for a “permanent” readily available, but flexi-
ible configuration of the recording area. Having the camera on a tripod, due to the physical configuration of the room, would not work since such a configuration would obstruct the path and be too time consuming to set up.

The making of the verbally and graphically annotated X-rays also clearly pointed out that turning consultations rooms temporarily into recording studio or a media space redefines and reconfigures the rooms in a fundamental way. The experiments pointed out that the activity of recording should not disturb nor intrude upon other ongoing activities. When setting up the experiments, we were present and made sure that the door to the consultation room at the outpatient ward was closed to allow for as quiet circumstances as possible to optimize the quality of the recording and to ensure privacy. The work at the outpatient ward is often hectic. Here, surgeons, nurses and nurses’ aides continuously coordinate their activities. Coordinating the surgeons, nurses and nurses aides’ activities means for example that the nurses and the nurses’ aides often check in on the surgeon to see how he or she is progressing and if they are needed during the consultation. Furthermore, informal meetings between surgeons, nurses, and nurses aides in the corridor are frequent. This means that the recording sessions can be disturbed by an entering nurse or nurses’ aide. Also, as one of the surgeons pointed out, it would be necessary to ensure that conversation from the hall will not be unintentionally recorded and infringe on the privacy of other patients. In other words turning the consultation rooms into recording studios did not only involve the immediate circumstance of a consultation between a surgeon and his/her patient. Activities outside of the immediate act of recording the X-ray movies need to be accounted for. It is important to signal to those in the surrounding areas that a recording is going on and the door to the consultation rooms should be kept closed.

6.4.3 Finalizing the films in relation to other ongoing activities

Although the staff did not find the recording of the films to disturb their normal workflow, the post-production or finalizing of the films was more difficult to fit into the ongoing activities. Burning the DVD videos made at the outpatient ward required the surgeons to click through a few menus in the camera and wait a few minutes for the DVD to become finalized. To produce and finalize the X-ray movies an editing program had to be started. Thereafter, the movie file had to be dragged into CD-burning software where several menus have to be selected and subsequently there is a wait before the CD is ready. This is all time-consuming. Our experiments not only raised the issue of how to finalize the films, but also who should attend
to both the preparing the recording and its post-production. Who should perform these materializations of scripts of actions or standardized ways of working?

Finalizing the films was seen as problematic by the physiotherapist because it would disturb the flow of their immediate activities. Having to wait for the films to become finalized would slow down the staff’s already tight and hectic schedule. It would require them to re-structure their activities. In this case, the physiotherapist would need to start on a new rehabilitation session while the video was being burned, and shortly into that new session take a break to give the finalized video to the prior patient who has been shown to the waiting room. Having the time to make videos depends, as one of the physiotherapists pointed out, not only on the immediate activity at the rehabilitation ward, but also how delayed the patients are from the outpatient ward and whether they need to catch the municipal patient bus. If delayed, the margins disappear and it becomes stressful to have one more task to think about and perform. In fact, to be able to give patients individualized movies, one of the physiotherapists that took part in making videos on his own in the later phase of the project, pointed out that he had to book two time slots when having a patient that was to be given a video to have the time for recording and finalizing the videos.

Finalizing the X-ray films at the outpatient ward was also seen to be difficult since it would slow down and disturb the workflow. The surgeons stated that they would have a difficult time attending to the post-production. They could not be expected to wait for the film to be finalized. The schedule there is tight and the next patient is usually already waiting in the next consultation room. A possibly division of work which was discussed was that the nurses and nurse’s aides could finalize and burn the movies as well as make sure that the CD-burner was loaded with a new CD-ROM, which some of the nurses said they might possibly be able to attend to. But the nurses and nurses’ aides work also involves complex coordination of two or more activities where they at times jump between nursing four patients. In the light of the intensity of work and complexity of coordinating different activities, starting the burning of a CD-ROM to thereafter attend to other activities only to return a few minutes later to fetch the CD-ROM, seems to be demanding too much of them.

Although who should finalize the movies has not been decided upon, and ultimately is an issue that the staff at the clinic would need to resolve, I am critical about how readily I accepted that the surgeons would not have the time for this task and that a more likely scenario would be that it would be attended to by the nurses or nurses’ aides. In truth, the nurses, nurses’ aides and the physiotherapists have just as a heavy workload as the surgeons. The nurses and nurses’ aides at the
outpatient ward have often more patients to attend to and more activities they need to keep track of and coordinate. In fact, it is unreasonable to expect that the nurses and nurses’ aides could more easily find the time to attend to the post-production at the outpatient ward. Also, expecting the physiotherapist and the nurses and nurses’ aides to be responsible for the post-production would reproduce to some extent the current documentation practices. The physiotherapists, nurses, and nurses’ aides seem to accept that they should handle the post-production while the doctors expect that others should handle the post production, be it nurses or nurses’ aides. This is similar to how the different practices of documentation operate today where the physiotherapist and the nurses document themselves (write in the nursing and physiotherapy journals) while the doctor dictate their summary of the consultation, which are transcribed by physician secretaries. Wagner argues, standards are not only procedures, instructions and the like, but also “standardized ways of doing things” (Wagner 2001, p. 535) She continues by citing Bush: “

The various ways people are enclosed, grouped, distributed, separated, and partitioned mark a related spatial organization of power and knowledge. These distinctions constrain our pattern of activity and interaction, and in doing so, they shape both our activities and us as agents (Bush 1998 in Wagner 2001, p. 535).

Standards and categories, as Bowker and Star (1999) and Star and Ruhleder (1996), have argued are ubiquitous and often invisible. Technologies and ways of organizing work carry standards, which affect human conduct and precisely because they are so pervasive and invisible need, as Suchman (1993) reasons, to be made visible since they are far from neutral. They are political and reproduce the values of the people who have made them. And they often favor, as Star (1991) points out, those that have made the standards durable. Arguments also put forth by Wagner (2001)

Given that the project builds on the clinics’ aim of being able to treat twenty or so patient per day, which in turn has generated their specific way of organizing, acting, and logistics of what effective patient learning is, it is not reasonable to expect that they will have the time or given more time to be able to record and finalize the films. It is therefore reasonable to assume that the practices’ needs and logistics will transform how finalization of the videos will be conducted. That it needs to become simpler is clear; preferably stored on-the-fly and given directly to the patient or alternatively temporarily stored in a media database and distributed electronically to the patient. And whatever way should be chosen it is important to attend to how the
standardized ways of producing the videos structure the staff’s work and distribute workloads.

**6.4.4 Self-produced documents, visibility, accountability and “unknown others”**

The project has not only raised the issue of how the films could be produced and distributed in a practical way, but also where, how and to what end the films are used, i.e., in what network of relations they enter and what implications that can have for both patients and the healthcare professionals. And in relation to this how the storing and distributing of the documents is made visible and transparent. As Wagner (2001) points out that how patient documentation is treated needs to be made transparent; where patient are informed about what regulations and policies apply to how the documents are made available, that is to what degree they are visible to other stakeholders as well as what rights the patient have in deciding what should be documented. Technical security measures, in the form of encryptions etc, in and of themselves are not sufficient, when it comes to digital documents.

This is because patient documentation is often considered by patient to be highly intimate and personal and “form an intricate part of the person’s dignity” (ibid). Wagner, referring to Reiser & Anbar (1984), points out that storing such information so that it becomes more publicly available may be viewed as “violation or even betrayal of their unique relationship of trust with their doctor/nurse” (Wagner 2001). Although legislative measures have been taken restricting the flow of information, “displacing the self in diversified, undetermined elusive location (Rodota, 1998) needs to be considered. The individual needs to know where, how and to what end the information is used. Wagner (2001) argues that “Individuals must not only have the right to determine the sharing of information with multiple (unknown) others, but exercise control over which information is collected and digitized in order to circulate in varying networks. She further points out that “responsibility for privacy and confidentiality cannot be shifted to the technology. Technical measures in and of themselves are not sufficient.” It is important for patients to know what regulations and policies apply to their medical record and how this material is treated needs to be transparent, which in many cases, it is not today.

Both at the rehabilitation and at the outpatient wards, the patients were given physical copies of the movies, which many of the patients have appreciated. A few patients have been asked if they would prefer to have the movies on physical and portable units or by accessing and downloading them by logging into a secure Internet site. The patients have not been negative to an Internet solution. However, they
have been more positive about receiving the films on a CD-ROM or other physical portable media. Having the videos on a CD-ROM makes it easier to view the movie in different places. Although big part of the population has an Internet connection, some do not or have a slow connection. Also having to navigate to a site, log on, and download the movie is cumbersome, especially if taking into consideration that patient would want to view it at different locations. In other words it seems as though having the media on physical storage makes it more accessible and thus more visible.

More importantly, as one of the patients stated, it feels better if the movies are handed over physically because then it is their responsibility to take care of it. What the patient seems to imply is that having their own copy means that they control access to the information. This of course would be the case if the films are not stored in any way at the clinic and not used for secondary purposes as has been discussed during the project. If the healthcare staff wishes to build up a library of cases to discuss and reflect upon, it would mean that the clinic would need to ensure, and have routines for the erasure of temporary copies stored on the computer or elsewhere and that if the films where to be stored for secondary purposes, this would need the consent of the patients. If the videos are made available through the Internet by the clinic itself or through an external company providing the service, this would mean that the patient would need to be informed on how, to whom, and for what purposes the material is made accessible. Furthermore, this would mean that data security issues would need to be addressed.

The visibility and transparency of where, how, and to what end the individualized patient films are used is also an issue that has been raised by the doctors. What surprised us after the first experiments was to what large extent the patients shared the videos with relatives, friend, and even in one instance with a colleague at work. One patient even stated that the X-ray film could be useful when dealing with the social insurance office. When we pointed this out to the surgeons, nurses, and nurses’ aide at the X-ray film review session, one of the surgeons pointed out that the recordings can be used for all kinds of unforeseen purposes and some patients might use them as documentation for compensation in work related injuries even if that is not what the videos’ intended use is.

The making of the individualized videos have in some sense placed the surgeon, physiotherapist, and the nurse in the same situation as the patient; where sharing the information with multiple unknown others suddenly could become an issue for them as well and not only the patients (although the healthcare professional still perhaps to a larger degree can control when and what to record). Just as giving patients the right to access their own medical records, giving patients individual-
ized films means that the relationship between the healthcare professional and the patient is to be reconfigured where new borders have to be drawn; in other words what the patient can demand and expect of them and vice versa.

How these borders should be reconfigured is to some degree different for the different professions. Neither the physiotherapists nor the nurses documenting their meeting with the patients have perceived any unforeseen problems with the documentation and its use. Part of the explanation could be that the documentation that the physiotherapists and the nurse have provided are late in the patients’ treatment where there are fewer uncertainties and concerns for giving a wrong picture of the status and the prognosis of the injury.

The surgeons on the other hand have been more concerned about what could become documented and the possible alternative and unexpected ways of using the films. They have been, for example, concerned that they potentially could promise too much and that the patient might use such promises against them. Part of their concerns can be explained by the fact that the video recording or X-ray films have typically been documentations made during the earliest phase of the patients’ treatment protocol when it is more difficult to give an accurate picture of the forthcoming treatment and its final outcome. Another explanation is that the films are in some ways similar to patient journal documentations which are accounts of the patients’ current state, or diagnosis, the proposed treatment and the prognosis. Documentation practices within healthcare, such as electronic patient records etc, are central artifacts in strengthening the accountability of work; structuring work and making it more visible and shareable (Wagner 2001 citing Cicourel 1990). In our case, this is between the patient and the healthcare professionals. Further, Wagner argues citing Garfinkel (Garfinkel 1967 in Wagner 2001) that these documents are therapeutic contracts, rather than “descriptive self-reporting” and Wagner suggests that we should view them as “‘technologies of accountability’” (a term she borrows from Suchman), which are records “of accounts paid and those still outstanding” (Suchman 1994, p.188). This is in line with what has been accounted for in the X-ray movies as described earlier in this chapter. However, as the surgeons pointed out during the X-ray film review session, they are usually careful with giving promises to the patients, but when they do it is important that they give the patients realistic promises that they do not have to revise considerably. Recording an assessment or prognosis that they would need to later on modify would be highly unfortunate.

Considering that the x-ray videos are accounts in Garfinkel’s and Suchman’s terms it is understandable that the surgeons stated during the review session that delimiting the recording to a concentrated period was to be preferred, although the two surgeons had not taken part in the experiments with video recording a whole
the recording will be used makes it especially important that they are in control of the production. As one of the surgeons stated at the X-ray film review: “When the recording is on, you should think about what you say.” The risk, according to one of the surgeons, (especially with video recording) is when being recorded becomes a routine conduct and you stop thinking about it; you have many patients concurrently and it is hectic and in the end you cannot keep track of what you have said and not said.

To whom the healthcare professionals are accountable probably affects what they will record. Making it visible and transparent for both patients and the healthcare professionals in what way the documents will be used and where and by who cannot be solely be controlled by technology. There needs to be an agreed upon mutual trust. And even though trust to some degree can be inscribed into the technology, it, as Brown and Duguid (2000) point out, is not a question of instrumental reliability. That we are willing to deposit our money into an ATM machine is not because it signals trust in itself. As they state: “Indeed, for most people a particular ATM isn’t transparent enough for us to judge whether it is instrumentally reliable or not. Instead, we look for reliability, both instrumental and moral, in the organizations represented by the ATM and by the institutions regulating those organizations” (Brown & Duguid 2000, p. 62). Trust as such can only to a small degree be inscribed into the technology.

### 6.5 SUMMARY

Throughout the project what aspect of meaning making should be put into play and how that could be materially configured has changed considerably. Both tools and practices have tentatively been transformed. The project also positively reproduced existing qualities in the practices. The rich media documents both reproduced and to some degree reconfigured the patient- healthcare professional relationship. The recordings take advantage of the collaborative articulation of the patients’ concerns and needs where the existing power relations and competences are in many ways kept intact. However, it reconfigures the relationship in the sense that the consultation sessions are stretched out; exceeding both space and time. The recordings give the patients better insight in hindsight into earlier consultations. Furthermore, it reconfigures the patients’ activities at home in the sense that it increases their sense of security. The films in turn have been reconfigured in the sense that the patients not only use them as learning resources, but have been redefined and defrosted into communicative artifacts that supports the patients in their articulation when giving relatives and friends a picture of their ailment as well as making their progression
more visible to themselves. As such the videos cannot be seen as having a homogeneous function or used only for a specific logic of meaning making, which from the surgeons’ perspective potentially could be problematic.

Although the patient–healthcare relationship is to a large degree kept intact, the hardening or fixation of their meeting in the form of rich media documents to some degree destabilizes their relationship. To whom the surgeons are accountable in the films cannot be determined at the time of the recording since the document might travel in unknown networks of relations. Similarly the patient does not know which network of relations the documents might travel or whether they will be used for secondary purposes. For both it is therefore important that it is made visible and transparent both technically and through informal or formal agreements to what end the documents will be used.

The recording of the films did not in any considerable way reconfigure the staffs’ workflow. The finalizing of the videos, or the standardized ways of performing that activity, on the other hand did and would demand considerable restructuring of their work activities. Needing to coordinate one more activity, which would interrupt their workflow, was considered unreasonable and too time-consuming. This in turn pointed out that the technology used was insufficient and would need to be redesigned where preferably the finalizing of the films could be done on the fly.

Finally, making the films transforms the consultation spaces into recording studios. First of all this means that the consultation needs in higher degree than before to be undisturbed during the recordings. At the rehabilitation ward this was accomplished by placing the DVD recorder in an open, but peripheral location where other activities would not come in the way. At the outpatient ward it was also considered important that the recording should not be disturbed, but also that the recording did not infringe on others privacy; catching peripheral patient accounts.
7 CONCLUSIONS

In this thesis the relationship between informal learning, new information technology and new media, and spatial issues has been explored. My aim has been to place the design of informal learning self-produced media within in the discourse going on within interaction design focusing on notions of space and place. I have in particular discussed in what way the notion of materiality, representation, and reifications has been viewed and what notions of materiality can be fruitful to work from when designing new spaces for learning and knowing.

Central issues that have been explored include how informal open-ended spaces for learning with the support of mobile self-produced videos could be made and used by the healthcare professionals and how it could be materially and spatially manifested in their environment. The focus has come to be in both projects on exploring ways of establishing spaces for learning, or spaces for action and reflection, that are closely connected to the on-going activities at work. This points to an interest and conviction that learning, knowing and working are closely related and supposes that separating working and learning is in many ways problematic. Believing that learning, knowing and working are closely entwined has meant that we needed to ask the question how new information technology and new forms of media pro-
duction can become an integrated part of work. Also, it has meant that we needed to ask ourselves how we can conceptualize such learning opportunities.

The argument put forth in this thesis is that design for informal learning is designing new heterogeneous spaces of relations. Designing support for informal learning and knowing with self-produced materials is in other words establishing new spaces for meaning making. These new practices of meaning making are heterogeneous in the sense that they consist of both human and non-human elements. They are also heterogeneous in the sense that they consist of different competences, different communities within communities of practice with their situated partial perspectives and trajectories. Designing in both projects has precisely been exploring and establishing new ways for the practices to organize their meaning making activities partially with the aide of new technology and new media. These new relational spaces for action and reflection (to some degree) overlap, intersect or weave into already established spaces of relations. These already established spaces of relations include how different professions, competence groups, etc are already connected. It also includes what practices have been established around making and using work documents such as work routines and tailored instructions. Further it includes what relations have already been established around location.

7.1 LEARNING, KNOWING AND WORKING

The thesis starts out with describing the practices as consisting of heterogeneous relational spaces. Firstly, they are heterogeneous in the sense that the social and the material are intertwined and cannot be seen as distinct elements. Meaning making is thus networked to specific social and material circumstances and needs to be learned through active participation in the practice. Secondly, they are heterogeneous in the sense that the practices consist of multiple perspectives and trajectories, which is reflected in the formal organization of work as well in informal ways of handling the diversity of work activities.

Examples both during the field study and the design experiments have pointed to the fact that the social and the material aspects of the practices are highly intertwined. Learning to become proficient at specific activities such as handling specific medical technical equipment demands gaining experience of performing the actual work. Gaining experience in turn is learned through mutual exchange as part of ordinary work. Handling the transport respirator at the ICU for example consists of a network of human and non human relations. Knowing how to handle the transport respirator means knowing how sick the patients are, what they can be expected to be able to handle, and how long the respirator can run, which in turn relates to both
the social and material aspects confronting the staff on their way to another clinic as well as the socio-material circumstance residing at the visited clinic, for example how long they typically can be expected to wait, what outtakes the clinics have, and how cumbersome the transportation will be due to a bad fit between the size of the beds and the elevators. Similarly at the hand surgery clinic a specific ailment or injury is socio-materially specific. In light of this it is understandable that the staff have emphasized the importance of learning that is intertwined with actual work and the need to spread and discuss experiences from actual work even more than is accomplished currently.

Central ways to deal with learning and knowing within both practices have been how they have organized their work and reorganized it. The work practices, although they can be seen as communities of practice, consist of heterogeneous communities within communities that have their distinct perspectives and trajectories, but that intersect and overlap. Learning, working, and knowing within both clinics means engaging in a complex practice where responsibilities are distributed between different professions, competence groups, and informally gained areas of expertise. These responsibilities and areas of expertise however overlap and one needs to find ways where the different areas can exchange perspectives.

Although the clinics have pointed out the value of mutual exchange or learning that is highly intertwined with work, they have also pointed out the need for collaborative critical reflection on their practice. Such collaborative reflection on the practice can happen both through explicit activities such as case seminars, but also through informal meetings such as discussions in the coffee room. In both situations documents pertaining to the daily work play a central role in engendering and guiding the discussions. Such situations of collaborative exchange have the double function of sustaining tradition and questioning aspects of their current ways of working and starting a process of change and development through questioning aspects of their practice.

7.1.1 Reifications in participation

A central insight from the studies of the practices has been how the practices are engaged in reifying aspects of their practices. Reifications in participation it seems have the double function of sustaining tradition as well as transcending tradition. Reifications, such as work routines, patient documentations, and tailored instruction, have the function of hardening aspects of the practices by establishing common ways of working. On a more mundane daily basis the practices constantly create temporary reification. At the ICU shortened messages were placed on medical
equipment to foreground aspects of an ongoing treatment, which in their context of participation could be interpreted and acted upon accordingly by other colleagues. These reifications engender the staff in their treatment of patients as they contribute to the configuring of spaces for action and reflection. At the hand surgery clinic the staff also used both more permanent as well as temporary reifications. Ephemeral reifications frequently used were their own hands, which the staff would use to discuss patient cases with their colleagues. Noteworthy from our study at the hand surgery clinic is to what little degree patients have access to reifications. Reifications in the form of documents available to the patients today are general descriptions of the ten most frequent ailments and general physiotherapy training instructions. (The physiotherapy training instructions are in some cases modified and adjusted to the patient’s specific needs). More temporary and individualized reifications are drawings made by the surgeons when explaining the injury as well as X-ray prints which are used to explain what has been done and the status of the hand.

Besides functioning as sustainers of tradition, reminders of how to perform certain activities, as part of day-to-day communication and for configuring the work environment, reifications have also played a part in developing aspects of the practices. I have for example described how reifications such as descriptions of work routines at the ICU were frequently questioned and lead to the need for developing new work descriptions. Common to these practices of reifications is that they are developed bottom up. Developing new work routines springs out of the practice’s local needs or discontentment with how certain activities are currently described and performed. When finding alternative ways other practices are consulted, along with books, journals, medical companies, and online medical databases. Developing the practice means in many instances reinterpreting their own practice while seeking alternatives elsewhere that need to be reinterpreted and translated to fit to their specific needs. Communities of practice are in some ways bound, but are also richly connected to other practices and sites. These communities of practices are not hermetic or closed, but rather highly dynamic and extravert.

### 7.2 Designing Spaces That Engender Reifications in Participation

An essential knowledge contribution in both projects has been showing the value of establishing spaces for collaborative action and reflection where the making and using of self-produced rich media documents that build upon the mundane concerns facing the practitioners in their daily work play a central role. In a sense both projects have thus ended up establishing new networks of socio-material relations
(socio-material infrastructure) that could in turn engender new processes where new networks of socio-material relations are temporarily established. These new socio-material infrastructures engender in other words the making of the rich media documents. Making these rich media documents starts a chain of inscriptions and translations where aspects of the practice are reified, people and artifacts are enrolled, and reifications are translated anew until a temporary and incomplete convergence between practice and reifications is established.

7.2.1 Hardening of a socio-material infrastructure

The socio-material infrastructure that was necessary to establish for facilitating the making of rich media documents, I have argued, cannot be seen as consisting of discrete objects or discrete human subjects, but rather as new practices where new spaces for action and reflection weave into already established spaces of action, which consist of both human and nonhuman elements. These new practices or spaces for action and reflection consist partly of both old and new ways of organizing and participating and practices of reifications.

The new artifacts have not been designed from scratch, but rather consisted of ‘generic’ and mostly off-the-shelf components that have been assembled. That they are off-the-shelf components does not mean that they are “fixed non-human actors” (Latour 1993) that can be inserted into the design process and the inscribed ‘will’ of the artifacts can force users to act and be in a certain way. Neither have human subjects been viewed as being fixed and unchangeable (Latour 1993). In other words neither humans nor non-humans have simply been inserted into the process. Instead the process has been one of recursive translation where both what the tools and aspects of the practices mean is changed. This process of recursive translation points towards a complex relational space where designers, healthcare professionals, patients, IT companies, the material aspects of the practice and the new tools introduced and designed are engaged in an iterative translation process.

7.2.2 The process of hardening at the ICU

I have traced how at the ICU the meaning making that was agreed upon for in-depth exploration was first of all how new learning resources could become an integral part of the ongoing work. Secondly, I have traced how new technology and new media could support shared meaning making. Initially the first issue was interpreted to mean a personal learning resource just-in-time and just-in-the right location. This in turn was interpreted to mean personal small displays that could fit
in the nurses’ and nurses’ aides pockets and location-specific tags. Simultaneously it was explored if shared meaning making could be supported by an ICU TV channel. Tagged information shown on personal displays was in turn translated into meaning self-produced videos tailored to the clinic-specific needs. This meant that a handheld computer of a specific size, screen size, resolution, clarity, storage capacity, and barcode slot needed to be found and chosen. A specific video player that could freeze the picture and pause for a long time needed to be selected. Software written that could make the barcode reader and media player work together was needed. Ways of tagging which co-exist with already existing practices of tagging needed to be found. Further, when exploring how the tagging of the videos could be done it was necessary to explore in what ways the nurses and nurses’ aides incorporated the videos into their work. These explorations showed that tying the tags too closely to a specific artifact or location would tie the activity of watching the videos to a specific location. Instead what was needed was a more flexible solution, which allowed the nurses and nurses’ aides to more freely configure their viewing of the videos. Previewing the video and watching the video in direct relation to the performing of the activity demanded different forms of configurations done at different locations. These design activities can, I argue, be seen as a form of socio-material hardenings or making of a socio-material infrastructure. What meaning making activities should be explored and how they could be materially configured thus went through several cycles of translations. In these translation processes both tools and practices have been transformed. From just-in-time, just-in-the-right-location personal learning supports it was agreed upon that the videos should function as checklists and reminders and be non-personal.

The process of making the videos also needed to be hardened. From the beginning efficiency and the ease of making the films guided our explorations. Rules of thumb for filming were established. It was agreed upon that the day-to-day language could be used in the videos rather than precise correct technical terms, and that the tone in the videos should be collegial and the videos directed to experienced colleagues rather than to newcomers. These agreements were part of establishing a form of new (media) language at the clinic. Further it was necessary to assert that all staff members should have the right to make videos, but that a special film-team that would function as a resource group should be established. Also, it was necessary to decide what type of documents the videos were, and it was concluded that they should be treated as written work routines and as such were mostly under the senior physician’s responsibility and thus needed to be quality assured. Quality assuring the videos in turn, it was decided, should be done collaboratively were a small group representing certain competence areas and the different professions at
the clinic would be present. Further it was decided that all colleagues should have the opportunity to participate in the review process whereby it was established that the different work teams would review the videos. This meant that organizationally, materially and spatially it was necessary to establish space for these activities of finalizing and quality assuring the videos. The film team was provided with a mobile post-production studio where the videos could be finalized and classified as either quality assured or quality unassured. The practice of making the videos, which from the start was envisioned as needing to be technically simple and efficient, was reinterpreted as the project progressed and viewed as a rich collaborative learning activity where different views of best practice could be put forth, discussed, articulated and critiqued. Even though it was agreed upon that the making of the videos should still be kept simple, efficiency was replaced by a lengthier albeit richer collaborative meaning making process where the staff got the opportunity to critically reflect upon mundane issues through reifications made in close relation to participation.

Although I point out here that a certain stability, fixation, or hardening was necessary to establish new ways of creating new relational spaces of shared meaning, making these hardenings are not final. The ICU has continued the process since we left the site where both new technical solutions have been explored as well as new spaces of relations have been established. I also would like to emphasize that the convergence process just described both technically and socially consists not of a single socio-technical ‘system’, but rather of a patchwork of overlapping meaning making activities consisting of diverse human subjects and diverse devices. The hardening in other words does not consist of a central computer system or knowledge database or one group of people engaged in collaborative meaning making. Instead it consists of a patchwork of different devices and groups of people, which partially contribute through different activities in negotiating how “best practice” should be represented in the videos. The different devices include the handheld computers and video barcodes, and a stationary computer for finalizing the videos as well as classifying them as not quality assured or quality assured videos. The different groups of people include the film team, temporary constellations of film makers, the work teams engaged in reviewing of the films, and the film reviewer consisting of a stable core as well as temporary members depending upon the issues addressed in the videos. The socio-material infrastructure we have aimed at creating is close to what Suchman (2000) has termed the artful integration of heterogeneous devices into hybrid systems. Artful integration is neither incremental nor wholesale transformation, “but an ongoing interaction between prior experience and leaps of faith.” What has guided the collaborative explorations has been how new meaning making activities that are meaningful and useful can become part of
a changed practice, rather than discrete technical solutions. In other words how different new forms of reifications can gainfully become part of different forms of participations.

7.2.3 The process of hardening at the hand surgery clinic

The experiments conducted at the hand surgery clinic pointed out that producing rich media documents on the fly as part of the patient healthcare professional interactions demanded stronger hardening than producing videos at the ICU. Yet, at the same time it pointed out, which had not been an issue at the ICU, how difficult it is to control, fixate, stabilize or harden the socio-material infrastructure in regard to distribution and usage when different practices intersect and share documents. These kinds of relational spaces involving people from different communities of practice turned out in this case to be more difficult to control through socio-material configurations.

The experiments at the hand surgery clinic pointed out that a range of hardenings would be necessary. It showed that specific locations needed to be dedicated to recording the rich media documents, what formats should be made available, who should be responsible for the different elements in the production and distribution of the rich media documents, issues regarding ownership of the documents, and by whom and how the documents could be used.

The hardening of a socio-material infrastructure explored at the hand surgery clinic first of all pointed out that a permanent readily available, but flexible configuration of the recording equipment was necessary (for the staff to be able to make individualized rich media documents on the fly). Having to configure from scratch the placement of the camera, the right angles, etc was too time-consuming when “mass producing” temporary rich media documents. Just as their current practice has worked out strategies for handling the steady flow of patients where different activities have their given place and time span, the clinic seems to need to designate the activity of recording to specific recording areas. These areas need to be easily accessible, readily available and undisturbed as well as not disturbing other ongoing activities. The activity of recording within these areas, being layered in a sense on top of older spaces for interacting with the patient, needs to signal to others that the area has temporarily been turned into a recording studio.

The experiments also raised the issue of who should prepare the recording and who should finalize the recording; activities that structure work and how the activities are delegated. In other words it was necessary to decide in what way the dif-
ferent work activities these new practices created should be delegated. Who should do what? For all of the professions, finalizing the videos was considered difficult to incorporate into the flow of their work activities since it would demand that they would need to attend to one more concurrent activity that would further fragment their work. To the surgeons and physiotherapists needing to coordinate one more activity, which would interrupt their workflow, was considered unreasonable and too time-consuming. The nurses and nurses’ aides on the other hand considered it possible that they could be given the task of preparing and finalizing the rich media documents. Who should perform these activities and how the work should be divided is up to the practitioners to decide. However, taking into consideration the nurses and nurses’ aides workload and their involvement in multiple concurrent activities, it is unreasonable from my perspective to expect that they should also be in charge of preparing and finalizing the rich media documents. I have therefore argued that for the making of the rich media documents to become part of the practice it is necessary that they are finalized on the fly and finished almost simultaneously as the consultation is over.

The experiments have taken for granted that the healthcare professionals are in control of the recording; deciding when to start and stop it. This builds on and reproduces the current social framing where the health care professionals control to a larger degree the structure of the consultations. How that control is maintained when the consultations are recorded, however, differs from profession to profession and demands that different forms of hardenings or stabilizations of how the patient healthcare professional relationship was configured anew. For the physiotherapists and the nurses recording large portions of the consultations has been unproblematic. The surgeons on the other hand have found it more reasonable to record summaries of the consultations in collaboration with the patients. Recording summaries rather than large portions of the consultations allows them to be more in control of what accounts are recorded.

At the same time that the hand surgery project pointed out that making rich media documents demanded larger hardening or fixation of the socio-material infrastructure, it showed the difficulty of hardening the use of the rich documents and that it only to a small degree can be regulated and made visible through the technology. For both the patients and the health care professionals it is important to know in what network of relations the documents will or might travel in. For the patient it is important to know for example if a copy is kept at the clinic. If so, for what purposes and who will be given access to them? For the healthcare professionals it is similarly important to know if the rich media documents are only used by
the patient to get a better picture of the treatment or for secondary purposes such as negotiating with the social insurance office.

Some patients have pointed out that they would prefer to receive physical copies of the rich media documents rather than having them available on a secure internet site. Having physical copies they seemed to believe would give them greater control of what networks the documents would travel in. Although the physical instantiation of the document does in no way manifest that the patients are the sole owner of the document it points out the patients wish to have control of their documents and that that control is made concrete and palpable. Although such experiments were not conducted, in what networks the recordings will travel can to some degree be regulated as well as made visible and transparent through the technical. (The documents could for example become automatically erased from the computer after being transferred to the patients’ storage media, which would be explained in the after texts of the rich media documents). Whether the documents are only to be used for the patients’ treatment or for secondary purposes such as collaborative reviews at the clinic as part of their own competence development or for research purposes can be agreed upon and controlled partially through the technology and as well as written contracts. As such hardening what networks of relations the rich media document will travel in from the patient’s perspective can be socio-technically determined. But from the health care professionals’ perspective it is more difficult to determine what network of relations the recording may enter. The patient equipped with the material can easily decide to use it for other purposes than originally intended. Determining technically and making it visible and transparent to the healthcare professionals where the rich media documents will travel and for what purposes it will be used is quite difficult. This makes it difficult for the healthcare staff to know to whom they are addressing and to whom they are being accountable. In what way the patients will use the documents needs to be hardened, but this hardening needs in many ways needs to build on mutual trust or written contracts.

### 7.2.4 Qualities of making rich media documents

Both research projects have shown that self-produced rich media learning resource documents have the advantage that they are tailored to the specific needs and concerns facing the practitioners as at the ICU and the practitioners and patients, as at the hand surgery clinic. Central to the content of these rich documents is that they reflect experience rather than de-contextualized facts. The rich media documents made at the ICU not only show how certain work activities are conducted at
large, but show instead established ways of performing the activity that reflect the experience of performing that activity at the unit. In doing so the staff foregrounds what their colleagues should be observant about and what can be difficult. The rich media documents made at the hand surgery clinic similarly take into account and contain the patients’ specific concerns and their specific experience of the ailment or performing the exercises. Central qualities of individualized patient information and training instructions are thus that they are collaboratively articulated and directly connect to the patient’s current situation. The learning resource in other words connects to the patient’s home and work situation in the short and long run and his or her personality traits, instead of speaking in general terms about the treatment. As such both projects have shown the value of in situ making of learning resources or rich media reification that are closely aligned to practitioners’ and patients’ mundane concerns and needs. Rich media documents, and in particular video, has proven valuable since it is closely aligned to the oral tradition of instructing and informing in situ through showing and telling, which are central ways of conducting shared meaning making in both practices.

The rich media documents made in both projects, although showing actual performance of the work and an actual encounter between patients and healthcare professionals, are formalizations. In other words, although recordings of a performance they fixate and to some extent formalize the activity. They neither fully depict what went on during the recording nor depict how the activity will need to be performed. However, that they formalize aspects of work is not seen as a problem per se since they are made and used in close relation to participation. This is what makes them different from typical generic work descriptions, instruction videos made by the manufactures, or other forms of generic standards and generic patient information. The decisive factor determining the value and usefulness of the reifications seems to be the relationship between formalizations or reifications and its closeness to participation. In both projects the formalizations or reifications made have built on close participation. At the ICU the reifications in participation consists of a known sender and a known addressee. The staff at the ICU has pointed out the importance of knowing clearly who they are addressing when making the videos and that they know the person when watching the videos.

At the hand surgery clinic the reifications produced and consumed are also made in close relation to participation where the rich media documents reflect the patients’ specific concerns. The patients have also appreciated that it is someone they have met at the clinic and they have established a relationship to that figure in the rich media documents. The closeness between reification and participation is however not the same as at the ICU. At the ICU the reifications are made between
known sender and known receiver. Further, at the ICU it is known to a large degree what relation the videos will become part of and that they will stay within the clinic. At the hand surgery clinic on the other hand the reifications are made as a part of a relationship that consists of a partially known sender and partially known receiver, and where the documents will travel is to some degree unknown.

### 7.2.5 Oscillating between reification and participation

The production process at the ICU being carried out in-house allows the rich media documents to be formed and transformed, reflecting the experience of the staff and therefore what knowledge is needed in their communities of practice. At the hand surgery clinic the rich media documents made on the fly did not in the same sense allow for iterative transformations of the documents. However, the making of the rich media documents reflected both the experience of the staff and the patients when generating patient specific learning and knowing resources that take into consideration the patients’ specific needs.

In both projects a central quality of making the rich media documents has been that it has engendered a fine-grained oscillation between what Wenger calls participation and reification. The oscillation between reification and participation has been central both during the recording of the rich media documents as well as during the reviewing and using of the rich media documents. A central aspect of these activities of making reifications in close participation has been that it has opened up an opportunity for collaborative discussion across competences of how certain work activities are performed or what it means to have a specific injury or ailment. The production process thus opened up for a place of reflection across professional boundaries and between healthcare professionals and patients.

Recording the videos at the ICU was conducted in such a way that it opened up the opportunity for a fine-grained on-the-spot oscillation between performing the activity and critically reflecting upon the performance. When making the videos the staff at the ICU would dive into the situation of making the videos were they would let activity and the physical setup aid them in their immersion, and help them determine in what order the activity should be performed and what should be highlighted and what should be disregarded, and determine what needs to be explained and what can be taken for granted. At the same time they need moments of separation when making the videos. These moments of separation help them reflect upon both what has been included and excluded, but also how it communicates to others. Here they need in a sense to project or imagine themselves as others; reposition
themselves where they can imagine how their ‘note-taking’ can be understood and possibly translated by their colleagues. This activity, we the researchers (Björgvinsson & Hillgren 2005, Brandt, Björgvinsson & Hillgren 2004), have suggested has design like qualities as described by Schön (1987) where a situation is named and temporarily framed and where the designer or practitioners oscillate between reflection-in-action and reflection-on-action.

The recording of the rich media documents at the hand surgery clinic being made on the fly did not allow for immediate oscillation between immersive performance of the activity and critical reflection. (The aim of these recordings was not to consider how they might be translated and transformed in another setting). The recordings, both at the rehabilitation ward and the outpatient ward, are collaboratively made reifications or freezing of ephemeral moments that can be revisited and critically reflected upon at a later time when watching the rich media documents in another setting with relatives and friends. The joint performance and dialogue centering around the hand or the representation of the hand are recomposed during the meeting, as well as the patients’ and the healthcare professionals’ names, and frame the situation facing them and on the fly name and reframe the situation exposing and gaining understanding of how well the respective partners have understood each other and what needs further explanation. This on the fly naming and framing, made by the healthcare practitioners and patients each with their partial and differently positioned perspectives (Haraway 1991), can perhaps be seen as reification in close participation.

7.2.6 Critical reflection and dialogue across boundaries

The film review sessions at the ICU in particular turned out to be an important part of the process of collaborative meaning through making rich media reifications. The film review sessions were important because they re-positioned the meaning making activity in two ways. First of all the reviews engendered a more distanced and critical reflection upon the activity under scrutiny. Secondly, the activity under study with the aim to establish a “best practice” was re-contextualized where the reification of the activity entered a broader arena or relational space at the clinic, which included various areas of competences and professions or communities of practice within a community of practice.

By watching a colleague perform a specific work activity the practitioners were re-immersed into the work performed, while retaining a distance and critical perspective to the immersed activity. In this instance the distanced revitalization was
the main state, rather than immersion into the activity itself as when making the rich media documents. I have suggested that during the review sessions the videos simultaneously function as instruction videos that are treated as such and analyzed along these lines, but at the same time the videos seem to function as simplified problem scenarios, although highly rich and performed, which the staff complement with their experience. In some instances the reviews worked well to expose cumbersome aspects of the practice, giving the staff insight and arguments for why current cumbersome practices needed to be done. At other times it helped develop their work practice, supporting them in articulating and exploring how certain activities could be done differently.

The making of the videos thus became an occasion where different competences could meet and opened up for a dialogue across the professions and competence areas. The senior physician would gain insight into how cumbersome it is for the physiotherapist and nurses to handle the CPAP. The physiotherapist in turn gained insight into what the nurses still find troublesome with the activity and so forth. Both the making of the videos and the video reviews showed clearly how the ICU contains multiple partial perspectives, which are differently situated at the unit.

From the start making the videos we envisioned as needing to be efficient and simple; a means to an end. Instead it became an opportunity to collaboratively inquire into current practices and why they have to be performed in a certain way and how they could be performed differently. The making of the videos was thus a recursive process were the making in some instances changed the practice and where the practice changed the videos. The process can, I argue, be seen as a process of convergence where different translations of a specific work activity are in the end reified, inscribed, and fixated. These fixations are, however “incomplete, unending and non-unitary” as Berg (1997, pp 167) has pointed out. They are not seen as truths, but temporary truths that make do at the moment and which are constantly open and in need of questioning.

Making rich media documents at the hand surgery clinic, it has been put forth, is a collaborative articulation where patient and health care professionals together frame and name the patient situation, needs and concerns. This collaborative articulation is doubly asymmetrical. The health care professionals on the one side set the stage since the recording is done within their professional domain and because they have been contacted precisely because of their expertise. On the other hand the patient is the expert on how the injury or ailment affects their daily life; insights which the healthcare professionals are dependent upon. The meeting between the patients and the healthcare professionals, I suggest, can be seen as a convergence of not only of tools and practices, but two distinct practices; namely that of hand sur-
gery treatment and the practice of everyday life. These convergences or agreements are however temporary accounts, which may change along the way.

The making of rich media documents in both projects has thus resulted in rich reifications or things to think with, which function well not only for activities of reflection-in-action, but also for activities of collaborative and critical reflection upon aspects of the practice or the state of the ailment or injury.

### 7.2.7 Consuming as collaborative production

Viewing space as relational and consisting of both human and non-human elements means that consuming or watching the videos is an act of production. It is an activity which consists of colleagues, location, patients, relatives, the video, the handheld computer and their socio-material qualities. Here again, neither artifacts, whether new or old, or social actors can be seen as passive, but they are rather active agents that need to be translated and transformed. Neither is pre-given or completely stable, but open and negotiable. Every new occasion as such is a unique ontological relationship; spaces of relations being an ongoing achievement.

This may seem to go against the arguments put forth previously that our design explorations have partially centered on hardening, stabilizing and configuring the socio-material meaning making. In fact I still argue that the material configuration or hardening of both the technology and the content of the videos made it possible for the staff at the ICU to integrate the rich media documents into their ongoing work. The size of the handheld computer in a sense made it possible that the video instructions could become integrated fairly easily into their ongoing work and that the staff could fairly easily shift between watching the video and performing the work. But at the same time I want to argue that the inscribed logics in the technology or the videos cannot be said to be pre-given. I have for example pointed out that the screen size works well when used by one person, but when used collaboratively at times causes problems. Similarly the videos having sound is in some situations non-problematic, but problematic at other times, disturbing other nearby activities. What I am pointing at is that although the design explorations have looked into ways of hardening, these hardenings need to be defrosted, appropriated, reinterpreted and used with judgment so that they can be made to fit into the ongoing activities. Using the videos at the ICU not only demands active reinterpretation and congruence finding between the instructions and the activity at hand, but also how it relates to other activities and where those activities are located. Colleagues need to negotiate how the viewing should be coordinated, what role the video should be given, and what roles they take during such collaborative activity. Watching the
videos also demands in some instances taking into consideration how the activity affects more peripheral activities. This demands that they monitor their degree of immersion, i.e., to what degree they can allow themselves to dive into the video and to what degree they need to be aware of other activities and adjust their relations accordingly.

The patients who have received rich media documents at the hand surgery clinic have also been engaged in an active reinterpretation of the videos. The patients’ use of the rehabilitation videos has shown that they are actively engaged in interpreting how the videos should be used when performing the exercises at home. Some patients have used them as scaffolds during the first sessions of performing the exercises alone while other patients have felt highly dependent, following them in detail repeatedly over the course of the treatment. Common to all of patients’ active engagement and interpretation of the videos is that the patients have been in a sense reconnected to the clinic and the staff’s know-how, calm and assured performance.

The rehabilitation videos have also been reinterpreted and used for other purposes than reminders of how to perform the exercises. They have been defrosted and redefined as communicative artifacts. These communicative artifacts help the patients to articulate and give relatives, friends and colleagues a better picture of their ailment or injury. The patients have in other words used the videos to connect relatives and friends to the activities that they are involved in at the clinic, but which relatives often have limited access to. Further, the rehabilitation videos have functioned as a reference point where the patients have been able to compare their current state with earlier instances. As such these rich media documents, both when used as training instructions and communicative rich media documents, cannot be seen as having a homogenous function or used for only one type of meaning making.

### 7.3 CONSEQUENCES FOR DESIGN

To begin with the consequence of my analysis is that materiality and the social need to be seen as intertwined processes rather than two distinct domains. Materiality, although to some degree in some instances it fixates that which is becoming, needs to be seen as an ongoing achievement rather than deadening or fixating lived experience and the practice of everyday life. Representations and materiality as Massey (2004) argues need to be seen as elements of continuous production, of becoming. In fact she suggests that we need to see such materializations not as representations, but as experimentations that receive their meaning through their relation to the
practices that produce them. This should be seen in the light of that reifications, be it in the form of representations, physical structures, or computer programs, have tended be viewed as deeply problematic within the literature concerning computer supported cooperative work and in literature concerned with space and place. These practices in turn are also open rather than closed and are ongoing achievements. This is closely in line with Wenger’s notion of reifications in participation and Lave and Wenger’s notion of communities of practice, which are made out of relations established around common concerns and that are continuously evolving. These arguments in turn are highly related to Berg’s (1997) notion of convergence without closure. The notion of convergence without closure points at how tools and practices as well as two or more practices recursively affect each other as they evolve and temporarily converge.

Viewing reifications and representations, such as software or instructions, as part of continuous production points at the close relationship between practice and tools. It further points out, as Chalmers (2004) has argued, that we as designers are precisely engaged in exercising choices of representation and reifications and are thus actively engaged in defining in what way new meaning making spaces of relations can be established. The meaning making as suggested by Dourish cannot be said to be only the business of the practitioners who will use the ‘tools’. As such the perspective set forth by proponents of actor-network theory, which emphasizes the importance of non-human elements, I argue, is particularly useful for design oriented research. This is because the perspective points out how material aspects such as new technological artifacts are discursive and in what way they are discursive needs to be explored, negotiated through a translation process where both human and non-human are transformed. Actor-network theory further points out how artifacts need to be able to perform to convince both the users and researchers engaged in the design explorations. This also points out that design research is rhetorical (Latour 1996) and a form of critique as proposed by Berg (1997) where new forms of socio-material practices are composed. A aspect of designing from this perspective is having a holistic view of the design space as suggested by Nelson and Stolterman (2002) or an engagement with the design situation as argued by Schön (1987) and that you as a designer locate relevant stakeholders as suggested by Krippendorff (2006). How you position yourself or locate yourself as a designer in this design space and what partial perspectives are given attention and/or ignored is a critical practice. Similarly in what way the tools connect to these networks of relations is a form of design critique, which engenders some activities and practitioners and constrains other activities and practitioners.
Also, a consequence of viewing the social and the material as intertwined means that the distinction between producing and consuming is blurred. This is because ontologies cannot be said to reside in discrete objects or subjects, but are continuously created as part of ongoing interactions. Using demands active production and congruence finding between reifications and the activity one is participating in. From a design perspective this shows that we as design researchers need to study how that which is designed is exceeded in use, and what choices are exercised or how people choose to use the technology not inscribed by its makers.

A further consequence of my analysis is to recognize space as interrelations. This view of space as ontological relations where meaning making is constantly negotiated is in line with proponents of actor-network theory, Doreen Massey’s (2004) view of space as extravert, lively and open, and Lave and Wenger’s (1991) notion of communities of practice where meaning making is continuously negotiated and thus pointing at how practices are constantly becoming. All of these authors emphasize meaning making as ongoing. Actor-network theory, has pointed by Callon (2004) provided analytical tools for how networks of relations are constructed and maintained. In design research terms this would mean researching how traditionally seen heterogeneous elements – practice and tools – can converge and be made stable or more precisely form temporary fixations or convergences without closure (Berg 1997).

Additional, that space of relations consists of what Massey calls coexisting heterogeneity or how communities within communities of practice overlap and intersect. In other words we need to recognize how communities of practice consist of various smaller communities of practice or groupings of people that actively work towards a common concern, each with their partial situated knowledge.

Finally, the methodological consequence of viewing space as relational means first of all that what the site is cannot be pre-determined. What elements of the relations come into focus will evolve as the research project evolves. In other words, what elements in a network of relations are to be considered cannot be defined a priori. This is a point put forth both by proponents of ANT and the anthropologist Hastrup (1996). When entering the network of relations what needs to be paid attention to will be revealed and it is only those elements that will demand attention than can be said to make up the network.

In summary, both research projects have looked into how different forms of reifications are translated and appropriated and made to fit in with specific spaces of relations and socio-material circumstances, and in turn how they affect those participating. In other words, how much they break with the normative established social framings, and how much the practitioners have to adjust and align their work
to make the producing and using of such material possible. In both projects the central outcome has been self-produced learning material that has been tailored to the specific needs of the clinic in the first project and the specific needs of the patient in the second project. In other words, both projects explored the possibilities and values of situated informal learning supported by information technology and mobile video. In both projects spatial issues have been central. That is, how information technology and informal learning intertwine in new socio-material networks of relations. At the heart of the matter has been how knowing can be reified, mediated, transported, and translated anew when entering new spaces of relations.
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The thesis discusses lessons learned and issues raised when exploring how self-produced rich media can facilitate sharing of meaning between healthcare professionals at an intensive care unit and between healthcare professionals and patients within a hand surgery clinic.

Design experiments conducted at the intensive care unit focused on how healthcare professionals could collaboratively produce ‘best practice’ videos displayed on handheld devices and accessed through barcodes placed out in the unit. The making of the videos it is argued can be seen as a temporary convergence of different views when reifying ‘best practice.’

Design experiments conducted at the hand surgery clinic focused on how healthcare professionals and patients collaboratively could produce, during consultations, rich media documents that are tailored to the patients’ specific needs. The rich media documents made can be seen as a temporary convergence of two distinct practices; namely that of hand surgery treatment and the practice of everyday life.

Making of rich media documents in both projects resulted in developing relational spaces of informal learning, which engendered the making of rich reifications that function well in close relation to participation. To engender the making of the rich media documents demanded the establishment and hardening of a socio-technical infrastructure which can be seen as a temporary convergence between tools and practices where both the tools and practices are changed.

In both cases using these videos in turn demanded that the videos, a form of local collaborative hardenings, needed to be translated anew and so to speak “defrosted.”

The design consequences are that designers need to acknowledge materiality as an ongoing process which is given meaning through participation over time within and across communities of practice. Materiality and human agency in this instance are not seen as discrete elements, but rather highly intertwined. The second design consequence is that we need to acknowledge the complexity, partiality, and multiplicity of such relational spaces. Methodologically, the consequences are that it is important to consider where the designers position themselves and the artifacts in the network of relations, since different positioning will have different implications for the subsequent spaces of action.

ABSTRACT

The thesis discusses lessons learned and issues raised when exploring how self-produced rich media can facilitate sharing of meaning between healthcare professionals at an intensive care unit and between healthcare professionals and patients within a hand surgery clinic. Design experiments conducted at the intensive care unit focused on how healthcare professionals could collaboratively produce ‘best practice’ videos displayed on handheld devices and accessed through barcodes placed out in the unit. The making of the videos it is argued can be seen as a temporary convergence of different views when reifying ‘best practice.’

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