Chapter 2

Interdisciplinary research on technology

Margunn Aanestad and Irene Olaussen

In Aanestad, M. and Olaussen, I. (eds) “IKT og samhandling i helsesektoren

Digitale lappetepper eller sømløs integrasjon?” Tapir Akademisk Forlag, 2010

In contrast to many other researchers who work with ICT in the health sector, the authors of this book do not primary belong to the disciplinary field of medical informatics, health informatics, or nursing informatics. We work within a broad, interdisciplinary-oriented tradition where the interplay between technology and organization is thematised. In order to give a basic understanding of our approach, we will in this chapter introduce four research traditions that in different ways have been significant to the interdisciplinary approach. We start with *sociotechnical system theory* and the *Scandinavian tradition of system development*. These traditions have historically shaped the basic assumptions about the necessity of a user-oriented perspective in informatics research. *Ethnographic studies* of work practices have been the most important methodological approach to the field, while *science and technology studies* have given important insights into how we think, write and talk about what we studied – precisely technology in a use situation. It is impossible to give a complete and at the same time brief overview over these fields. Instead we try to present the main ideas and concepts, and to provide some examples from specific studies, in particular those that deal with medicine, health and ICT.

In the end, we discuss which insights have already emerged from the research in this interdisciplinary field with regards to ICT in the health sector. However, while most of the existing literature has focused on the introduction and use of digital technologies in a concrete and local organizational context, we thematise in this book the use of ICT that goes out of the local context. We focus, in other words, mainly on the interaction between different actors or levels in the health sector.

Historical roots

Sociotechnical system theory

With the industrial revolution came also mass production, where new technology was taken into use to make work more effective. The other side of the medal was soon pointed out: alienation was identified by Karl Marx as a central aspect of the modern society. Additionally, technology skepticism had an impact on popular culture. Fritz Lang's dystopian future scenario in the science fiction movie *Metropolis* had premiere in 1927. Workers' conditions at the assembly line were publicized by Charlie Chaplin in the hit comedy *Modern Times* in 1936. Aldous Huxley published *Brave New World* in 1931, and George Orwell's social science fiction *1984* came in 1949.

Frederic Taylor's ideas on "scientific management" were challenged during the 1920s by researchers who pointed at the importance of the psychological and social aspects of work, as Elton Mayo (founder of the Human-Relations movement) and his colleagues Roethlisberger and Dickinson. In Europe this critic had an impact in form of the sociotechnical system theory developed by The Tavistock Institute of Human Relations in London, United Kingdom. Eric Trist and Ken Bamforth's studies of the organization of work in the British coal mines after the Second World War were central in the formulation of this research stream (Trist and Bamforth, 1951). The mines were nationalized and modernized, but a paradox emerged: even if new and better technology was introduced, the productivity of the mines went down. Even if the salary increased and the standard working conditions improved, workers' absence increased. Bamforth (who himself had worked in mines) and Trist analysed the new mechanized production method and showed how it destroyed the social relations that previously helped regulating work and cooperation. Work became more specialised, and therefore more individualized and divided. There was less variation in the work tasks, and more control from above (Gustavsen, 1990, page 20). The organization that resulted became less robust against deviations and it became more problematic to handle problems. When a problem occurred, the workers usually blamed someone else along the "chain". The individualization process resulted also in competition on the best places and the easiest tasks, and bribery of work managers was not uncommon. At the same time researchers discovered also that informal groups were formed where two-three workers collaborated and adjusted work so that each other could work within the best possible conditions. Before new technologies were introduced, they were used to cooperate in such groups, have shared responsibility for the results and rotate between tasks. Trist and Bamforth argued in favor of returning to the group-based organization of work, but still using the new technology. When work became organized after these principles, absence from work was drastically reduced and productivity increased again.

Good interaction between the *technical* and the *social subsystem* became formulated as a central guideline in sociotechnical system theory. Mines' owners had been thinking too narrowly. They had been concerned only with improving the technical subsystem and had not seen the importance of the social subsystem. These two subsystems cannot be optimized separately, but must be seen together, said the sociotechnical researchers. Also, the principle that workers' responsibility and autonomy (their right to make decisions) should relate together, was important. Based on this understanding, self-governed groups were strongly recommended.

The main method in sociotechnical research was action research[1]. In an action research project the researcher has a different role that the classic observant role. This is a method where one tries to bring change, and the researcher takes part in the process together with the organizational partners or project participants. Research should contribute to both examine and solve concrete and practical problems that participants experience themselves, and at the same time should contribute to expand scientific knowledge.

The sociotechnical ideas on the organization of work gained significant attention in Norway in a community that later (in 1968) became the Work Research Institute. Early in the 1960s, a cooperative project between LO and NAF (that today is called NHO) was started. This was a national research and development project that was based on sociotechnical principles and oriented towards democratizing industrial work (Thorsrud and Emery, 1969). Even if this project focused on the organization of work and it was not an ICT project, the project became (and in general the entire socio-technical stream) an inspiration also for researchers within informatics (Olerup, 1989).

[1] See (Argyris, Putnam & Smith 1985) for an introduction to action research as theory and method. The book is also available on line: http://www.actiondesign.com/resources/research/action-science

The Scandinavian tradition for user participation and system development

The Scandinavian informatics community incorporated many insights from the sociotechnical tradition. Central points were the criticism of a one-sided focus on management-driven requirements for efficiency, and the emphasis of workers' experience and quality of work. Also, action research has had a long and broad acceptance in the Scandinavian informatics environments. There were however differences in views on the relationship between management and workers. While socio-technical systems thinking emphasized the common interests between workers and management and sought consensus, the Scandinavian tradition built on a critical Marxist perspective in which the relationship between management and workers were seen as fundamentally conflictual. When computer-controlled production machines and production management systems began to appear in the factories, some Scandinavian researchers decided to ally themselves with workers rather than managers. This was the background of many action research projects that became known as the Scandinavian union projects. According to Jorgen Bansler's (1989) interpretation, in the 1950s and 1960s the Scandinavian trade unions had been positive to the introduction of technology. They expected that new technology would lead to higher living standards for everyone, including workers. During the 1960s and 1970's came, however, more and more critical voices that pointed to negative consequences for work conditions and to health problems caused by technology. The unions took a more critical position, if not towards the technology itself, towards the way it was introduced. They realized, however, they had little knowledge about technology so that they were largely at the mercy of management (ibid., p. 13-14).

In Norway, Kristen Nygaard[2] and Olav T. Bergo, when working at the Norwegian Computing Centre, organized in 1971 an ICT project together with one of the largest unions, the Norwegian Iron and Metals workers federation. The purpose was to strengthen the weaker party (i.e. the workers' representative of the union) with knowledge on the new technology so that they would become stronger when negotiating technology adoption with management. A/S Hydraulik in Brattvåg, A/S Kongsberg Weapons Factory in Kongsberg, A/S Norwegian Electrical & Brown Boveri (NEBB) in Oslo and the bicycle factory Jonas Øglænd A/S in Sandnes were the companies that participated in the project (Nygaard and Bergo, 1974). The union projects received significant attention and had relevant political consequences. Along with the general trends of democratization of the work life as a result of the cooperation between LO and NAF, they led in the early 1970s to the developed of the so-called "data agreements" in many companies, and to the right of workers' co-decision in ICT projects that was later formalised in the Working Environment Act. Similar projects were organized in many other countries. In Denmark, Aarhus researchers led, with Morten Kyng as head, the DUE project (Democracy, Development and Edb) between 1977-1980 (Kyng & Mathiassen, 1982). In Sweden, Pelle Ehn and Åke Sandberg led DEMOS (DEMOcratic management Systems) between 1975 and 1978.

[2] Together with Ole Johan Dahl, Kristen Nygaard is also known for having developed the programming language SIMULA and set the basis for object-oriented programming, today used all over the world.

When the 1970s ended, Scandinavian system development research had in a certain degree changed. From the earliest projects it was experienced, among other aspects, that the unions were tied up in an institutionalized relationship with the employers, which left little room for radical changes. In the practical work they had a tendency to give priority to job security, higher wages, and shorter working hours (Bansler, 1989, p.16). Instead, of directing research towards the major changes occurring in the work life, it seemed that the research focus was somewhat narrower. Later projects focused on the tension between expertise and automation. This problem was pictured in a dramatic way by Harry Braverman in his book *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century* (Braverman, 1974). Through an analysis of both manufacturing and service occupations Braverman showed the consequence of "scientific management" and adoption of new technology. He claimed that this led to a de-professionalization of previously craft work. People's knowledge formerly used to carry out the work was built into the machines, which eventually took over the work. The decisions that people used to take were automated, resulting in a less rewarding and challenging work life characterized by a move away from the craft of practice and towards the assembly line. Joan Greenbaum (1995) has described a similar development with regard to the introduction of ICT in office work.

Many of the subsequent research projects in the Scandinavian tradition built on this understanding of the problem. They sought to ensure that systems are built on and supported the workers' knowledge rather than built to automate their work. Metaphors that were used were often linked to traditional crafts, and the dominant technology understanding during this period can be captured by the "tool" metaphor. A tool springs organically from the work requirements and supports and underpins the work (Ehn, 1988). A well-known example in this tradition is the UTOPIA-project[3] between 1981 and 1985, where researchers worked with graphics to create tools using the computer's new capabilities for graphics functionality. Another well-known Norwegian project from this period was the Florence project, which lasted from 1983 to 1987. This was not a union project, but had anyway a clear professional orientation to nurses. Two informatics researchers and a social anthropologist followed the work of nurses and secretaries at Voksentoppen center for asthma and allergies for children, part of the National hospital, in the period 1983-1985, and at the cardiology department at Akershus Central Hospital in Lørenskog in the period 1986-1987 (Bjerknes & Bratteteig, 1987). The Florence project focused on the development of ICT support for nurses (work plan, Kardex system and procedure archive) and had a clear user-oriented perspective. It was pointed out that computers should be seen as tools that supported and contributed to the work (Bratteteig, 2004, p. 26). Therefore, the technology should primarily be developed and evaluated on the basis of the value and benefit to the user, and this should have priority over the assessment of the usefulness for the organization as a whole. The Florence project generated insights about the design work as a process where mutual learning was important. How should nurses and researchers in informatics be able to cooperate and understand each other language? What kind of techniques, methods and tools are suitable for this? How should actors formulate and represent the new joint, interdisciplinary knowledge?

[3] UTOPIA stands for "Utbildning, Teknik och Produkt I Arbetskvalitetsperspektiv". See (Bødker, Ehn, Kammersgaard, et Al. 1987) and (Bødker, Ehn, Sjøgren, et Al. 2000).

These and other projects helped make "the Scandinavian tradition" into a concept for the international informatics community. Their explicit ideals of democracy and emphasis on user-oriented, participatory design has inspired and mobilized many other researchers and system developers. These activities are among the most important sources for the approach called "Participatory Design" (Schuler & Namioka, 1993, Greenbaum & Kyng, 1991, Muller & Kuhn, 1993), which also includes approaches where the concept of participation does not necessarily include the original ideals of co-determination and democratising.

Studies of work, cooperation and technology use

Both the Scandinavian system development tradition and the “Participatory Design”-field advocated a concrete and actual user involvement in technology development. This was considered a central principle. It was the workers, the future system users, who owned their knowledge and who were responsible for their own situation. Surrogates for the user, for example in the form of abstract representations of the work, were not considered sufficient since these were often made based on management's wish for efficiency. System developers and users had to concretely work together and learn from each other. System developers learned about use areas, and users learned about technology's possibilities and limitations (Ehn, 1988; Bratteteig, 2004).

However, the possibility of such extensive user participation was often in practice rather limited, and other researchers looked for other ways to obtain the knowledge they considered necessary in order to create good requirements specifications. In some projects ethnographers and social anthropologists were employed to study work practices[4]. Ethnographic studies are characterized primarily by field work over a certain period of time as the central way of working. The researcher is a participant observer in a real situation and studies "naturally occurring" activity, implying that experiments and laboratory research are not employed[5]. When ethnographers conducted studies of ICT systems, they did not produced abstract and schematic flow diagrams and process descriptions, and they were also not after studying classical sociological themes, as technology’s impact on the organization, job structure, power relationships, etc. Instead, they produced empirical and "thick" descriptions (Gertz, 1973) of the ongoing interaction between people and the

[4] To enter the field and create representations of work practice of others was not seen as unproblematic. See the discussion in the September issue in 1995 of *Communication of the ACM, 38, nr. 9.*

[5] The inspiration for this ethnographic-oriented research was the Chicago school's micro-sociological studies of everyday life and work. Qualitatively oriented interaction-sociologists, as Everett Hughes, Howard S. Becker, Erving Goffman, Anselm Strauss and Eliot Freidson, were important for informatics research in order to understand the organization of work and human interaction with and through technology. For an introduction to the Chicago school and the symbolic interactionism tradition that was developed there, see Collins (1994). For more literature on ethnography and technology see Vinck’s book *Everyday engineering. Ethnography of Design and Innovation* (2003) which deals with ethnographic studies of design and innovation projects. The book takes also a different understanding of materiality and objects in ethnographic research and the reflexive turn in the subject.

technologies they used in their everyday work. Accordingly, for ethnographers it is not enough to say that work practices are complex; we also need to unfold this complexity and show what it means in the real situations workers deal with. Therefore ethnographic studies focused on following processes as they unfolded when one started to use technology; they studied the actions and not just the effects of the actions. The researcher followed workers through the work day and talked with them along the way (at least to the extent tasks provided an opportunity to do so), and had both informal conversations and possibly more structured interviews. Audio and video recordings were also used. Then, one could also sit down with the workers who had been observed and get an explanation of what had happened in the situation (Blomberg et al, 1993; Jordan, 1996; Karasti, 2001).

Such thick descriptions from the practice field were central premises for developing an interdisciplinary informatics research, particularly in the field called "computer-supported cooperative work" or CSCW where cooperation and technology is studied. CSCW built partly on the work of sociologist Anselm Strauss, who highlighted the invisible work, for example in the hospital context (Strauss, Fagerhaugh, Suczek et al, 1985). While visible work can be specified and described, CSCW studies directed attention towards not-formalised work that also took place but escaped the formal methods for capturing the required specifications for ICT systems. Through their empirical descriptions the scientists described the whole ecology of visible and invisible work. John Law (1994) called this form of research (which was inspired by symbolic interactionism) the "underdog sociology" because it is often used as a political counterweight to the corporate formal representations of the organization, where low status work tends to remain invisible to those with higher status if they have something to gain from it.

Within CSCW, it was especially a series of so-called "control room studies" that were important to understand cooperative work and its implications for technology support. The setting gave good access to observe coordinated cooperation. It was studied, for example, how the ordering of airport traffic was organized (Suchman & Trigg, 1991), how traffic in the London Underground was controlled (Heath & Luff, 1992) and how the ambulances were coordinated (Martin, Bowers & Wastell, 1997). The Norwegian AMK (Norwegian medical emergency call) centers have been studied from this perspective (Tjora, 1997, 2004). These studies look specifically at how individual and collective work is intertwined. They describe, among other things, how the tools that were used allowed individual workers to have attention for each other while they were doing their tasks, and therefore to be able to monitor and coordinate their actions with each other. These studies identify a number of important resources for collaboration, for example, what we might call "peripheral awareness"[6]. By overhearing what others talk about, or from what we see and hear in the environment, such as the sound of machinery, the amount of phone calls, or the height of paper piles, can we infer if things are flowing smoothly or if something unusual is going on. Another term used is "articulation work" (Strauss et al, 1985). The term points to the work that must be done on the side of what one "actually" must do; what must be done for things to hang together and function[7]. It may be

[6] The term "awareness" is used for example by Dourish & Belotti (1992) and by Heath & Luff (1992).

[7] See (Gerson & Star, 1986), (Schmidt & Bannon, 1992), (Robinson, 1993) and (Suchman, 1994).

necessary to do something extra to deal with the local circumstances and unforeseen problems, or it may necessary to talk about the extra work related to organizing cooperation (for example, in order to divide tasks among themselves and to compile results in the end). Similarly, several studies have identified that paper documents play more roles than just being an information vehicle. For example, when incoming requisitions is placed on a shelf, they also work as a specific "signal" in the workflow saying that there is a task to do. Many of the initial digitization efforts overlooked such aspects (Harper & Hughes, 1993).

Of the more ethnomethodological[8] oriented studies of IT systems, one of the first and without comparison the most famous, was conducted by Lucy Suchman who worked at Xerox PARC (Palo Alto Research Center). Xerox had developed new and advanced copy machines, but customers complained that they were too difficult to use. In her study (Suchman, 1987, 2007) Suchman describes how even her colleagues at Xerox ran into problems when they tried to use them. Through video recording of how users responded to the copy machine's instructions, what they said and what they did, she documented how the interaction between user and copy machine happened. The copy machine was programmed according to a model for how the user could be expected to reason and act, based on the prevailing theories in the field of human and machine interface (Human-Computer Interaction, HCI) and AI (Artificial Intelligence, AI). These understandings were mainly individually and cognitively oriented. The programmers assumed that our actions were guided by predefined and rational goals and plans, and that they could design the technology on this basis. Suchman used her observations to show that users' actions were not governed by such plans alone but that there was a dynamic adjustment of the actions in the situation, which was based on the responses users received from copy machines and from colleagues. "Situated action" was a concept that sought to capture the role played by the material and social environment. This study was of great importance as a fundamental critique of the HCI and AI fields, and had important implications for the future design of interactive systems.

This specific approach was also used by many to study for example how interactions between people were affected by new technology, or how people related to the technology (they interacted with). These studies rely on very detailed renderings of conversations and actions, and video or audio recordings are usually used. Researchers consider everything that is said, and also if the speaker stops and hesitates. They include quantitative data on how long the pauses are, and will indicate if someone talks at the same time. They describe how people are sitting or standing, the movements made, and the direction in which the people have directed their gaze. Based on such detailed studies physician and patient conversations with and without electronic medical records systems were analysed (Heath, 1986; Great Batch, Heath, Campion, et al, 1995), or how radiologists related to automated detection of tumors in mammography images in connection with screening for breast cancer (Hartswood, Procter, Rouncefield, et al, 2003).

[8] Ethnomethodology is a micro-sociological, empirical approach that seeks to understand how social order occurs, for example, in normal human interaction as a conversation. The concept was launched by Harold Garfinkel, and "methodology" should not be interpreted as if it refers to a research method, but the methods (the study) people use to create social order. This is studied by means of ethnographic research methods.

Producing thick descriptions was cumbersome and took time. Moreover, it was not clear how the findings, which were often presented as comprehensive descriptions in plain text, had relevance for designers and system developers. It derived that system developers themselves performed "lightweight ethnography", described as "quick and dirty ethnography" by Hughes etc. (1994). They used perhaps only a few weeks to get an idea of how the work was organized so that they had a better idea of how to design the solution. Diane Forsythe (1999) and Graham Button (2000) are critical to such a dilution of ethnography. Button characterizes it as a shift from "analytically oriented fieldwork" to "scenic" fieldwork, where one recount only what has observed without any attempt to provide a theoretically driven analysis. Kjeld Schmidt (2000) agrees that there is a distinction between specific and design-oriented ethnography used to create requirements specifications, and the more understanding-oriented ethnography that contribute to general theoretical conceptualizing. It is this last category that has had most impact on the field in the long term, in that it has been able to say something fundamental about how collective work is organised[9].

Science and Technology Studies

Science and Technology Studies (Science and Technology Studies, STS) is another field that provides analytical resources for understanding the interplay between science, technology and society. The STS field emerged at a time when the unconditional trust in science and technology as a unilateral positive progressive project began to break. In the wake of the 1960s and 1970s reaction against the proliferation of nuclear power, the use of napalm in the Vietnam War, the green revolution and the spread of pollutants such as DDT, science and technology were seen negatively. Thus there emerged demands and attempts to democratize science and technology, and critical analyses were developed in which the researchers took into account social relations and contextual factors. An important academic inspiration for this field was the book *The Structure of Scientific Revolutions* by Thomas Kuhn (1962), where he describes how within science there was not only a gradual accumulation of knowledge, but also major upheavals or paradigm shifts. According to Steven Shapin (1995), there were three main elements in Kuhn's approach that have been important for the development of STS: Science as culture, science as material practices and case study as methodology.

Firstly, Kuhn's work set the premises for problematising the idea of science as a catalyst for a given and objective reality. Instead, it was possible to study science as culture, as a social construction of specific and locally situated truths. It follows, secondly, that science can be studied as a concrete and material practices. Science had traditionally been represented as a cognitive, formal and rational activity in which formalism, laws and theories reigned. Kuhn turned the attention to the scientific production as locally rooted expertise, tacit knowledge and embodied perception. Thirdly, Kuhn launched the empirically based case study, which

[9] For a discussion of the ethnographic approach in information systems theory see the special issue of the *Scandinavian Journal of Information Systems:* “Challenging divisions: Exploring the intersections of ethnography and intervention in IS research” (Pors, Henriksen, Winthereik, & Berg, 2002).

was an important methodological entrance to the study of science and technology. Kuhn gave no summarily and abstract arguments. Instead of describing science as a coherent whole, he developed detailed empirical descriptions of important concrete specific individual cases in the history of science. It is through these empirical works that we learn about his philosophy of science.

According to John Law (2008), the STS-field is characterised by this analytical way of working, where discovery and exploration, critical descriptions and explanations are presented through case studies. STS-scholars are dedicated to providing comprehensive ethnographically inspired descriptions of techno-scientific practices, where empirical descriptions and theory go hand in hand. An STS-analysis does not start with a theory and then apply this empirically, but theory and data are generated simultaneously. Thus, the empirical case studies are important. They make theory explicit and subject to critical reviews[10].

Since its start, STS (Science and Technology Studies) has grown and established itself as an academic field with many different thematic branches, as *Innovation Studies, Cultural Studies of Science, Research Policy, User Studies, Public Understandings of Science* to name some. As result of this development, it is then possible to tell many different stories on STS. The one we present here is about the development of a (material semiotic) approach to the study of science and technology (see also Asdal, Brenna, & Moser, 2001) and has had great influence on interdisciplinary studies of ICT in healthcare[11].

Towards the end of the 1980s, a group STS-researchers started to develop a post-structuralist approach to science and technology studies[12]. In line with previous STS-works these scientists argued that science and technology production does not differ fundamentally from other social and cultural activities. At the same time they wanted to avoid presenting science and technology as governed by social interests. Instead they developed analytical resources based on an anti-essentialist approach to science, technology and society. This is an approach that favors neither nature (realism) nor culture (social essentialism) when explaining the phenomena one observes. The result was the so-called Actor-Network Theory (ANT). The starting point is an understanding that reality is not given, but under continuous construction based on the methodological imperative: "follow the actors". Thus researchers as Madeleine Akrich (1992), Michel Callon (1986), Bruno Latour (1987) and John Law (1987) went into laboratories, design departments, production halls and medical institutions to study the "Science in Action", that is, the ongoing construction of techno-scientific facts and products. The core of the approach was the interest in materials, objects and surroundings that make up our social world and the processes in which these are in relation to each other. ANT has its roots in semiotics that considers how importance, meaning and status are not an

[10] This is reflected clearly - literally - in the works of John Law (1994) and Anne Marie Mol (2002), where field notes, theoretical snippets and analytical discussions run in parallel throughout the text.

[11] See, for example, contributions in Mol and Berg 1998.

[12] See Moser 2006 for a discussion of how the approach relates to and builds upon the work of Michel Foucault about the productive and regulatory power of discourse.

inherent essence, but a result of how things are put together (Law, 1994; 1999). Therefore, ANT is often referred to as a material semiotics.

Ingunn Moser (2006) explains that an important starting point in ANT is that "the social" in the pure form is an abstraction that does not occur in the real world. There are always included both bodies, tools, objects, facts, technologies, and a whole lot of things in social practices, and social communities and cultures can not be thought, understood or studied without them. But at the same time there are no clear, scientific facts and technical artifacts either, just facts and artifacts coming in, be productive for, and participating in organizing specific social or cultural contexts. What we should study then is neither technology, society nor culture, *per se*, but the actual practices that connect diverse social and material elements. It is these relations that are productive, not just in terms of facts and objects, but also in relation to the subjects, communities, discourses, institutions, power and differences (Asdal et al, 2001). ANT is fundamentally skeptical of traditional sociological explanations that are based on "global" categories and meta-narratives. For example, the "biomedical power," "risk society" and "professional conflict" concepts, ANT would argue, are not explanations, but the phenomena which itself requires explanation. What social and material elements draws together, for example, biomedicine in order to establish its power, suppress opposition and stabilize, maintain and reproduce so that it is considered a large-scale phenomenon?

During the 1990s and at the beginning of the 2000s, ANT met an increasing criticism. Many of the early ANT studies concerned the "mighty men", key stakeholders, scientific heroes and brilliant technologists, and in some cases failed entrepreneurs. It led to not noticing the non-standardized and marginal positions, and the stories told nothing about those who were excluded from the actor network; a criticism voiced by Susan Leigh Star (1991). Researchers increasingly oriented also on use and users (see, for example, contributions in Oudshoorn & Pinch, 2003 and Rohrracher, 2005), which opened up new areas for empirical analysis and led to theoretical development. A key contribution in the medically oriented STS research is Callon and Rabeharisoas (2003) study of French patients with muscular dystrophy. The authors study the traffic at the boundary between professional and lay knowledge in the medical field. They show how the patients are not passive recipients of medical expertise. By organizing and documenting their everyday experiences with their disease, patients contributed to formalize and spread a form of knowledge that had previously been considered a private matter. As producers of knowledge, patients could interact on an equal footing with the medical experts. Through the patient organization, they set a program for financing research and established channels of communication between researchers, clinicians and patients. Thus, they help to define the content and direction of the medical research on their disease.

This and similar studies of techno-scientific traffic at boundaries, altered ANT in a more postconstructionist direction. ANT-core, as the interest in knowledge, practice, heterogeneity, processes and relationships are intact. The new focus is on ways of organizing multiplicity, performativity (as in the term "enactment" or exercise) and floating objects. We can exemplify this new focus through Anne Marie Mol's (2002) study of atherosclerosis (the hardening of the arteries). Mol studies how atherosclerosis is diagnosed, treated and studied through multiple practices in different departments of a Dutch hospital. She looks for atherosclerosis in the medical encyclopedia, the clinic, with the physiotherapists, on the operating table, among radiologists, pathologists and among researchers. Some of them are talking about pains that come and go depending on activity, others about thickened inner walls of blood vessels. Others talk about pressure differences between the ankle and wrist blood pressure, or refers to atherosclerosis in the form of a number - an indication of the degree of narrowing of blood vessels which is measured by X-ray image. The object's identity, its existence, is in other words fluid. An episode in the pathology laboratory is illustrative. Pathologist says: "Look here! Here you have atherosclerosis. It is this. A thickening of the intima. This is what it really is". And then he adds after a pause: "Under a microscope." (Ibid. page 30). Annemarie Mol makes a point out of this: "When under a microscope is added, it does not exist the thickened intima alone, but through the microscope. […] My ethnographic strategy is the art of never forgetting microscopes "(ibid., p. 31). The microscope works here as a metaphor for the social and material conditions of possibility that something may be exercised and be real. Mol point is that it is in the various practices that reality (in this case atherosclerosis) is produced, and that there are many of them. It is not only different perspectives on the same underlying object, but there are many objects, each of them produced in each practice. These objects coexist in different ways, either harmonious, problematic or mutually exclusive. By highlighting the diversity, it is also possible to make choices between them. If atherosclerosis is a narrowed blood vessel on the surgeon's X-ray, if that is what atherosclerosis *is*, then it is also natural to choose to perform a surgical procedure to remove the affected part. However, if atherosclerosis is the pain that comes and goes depending on the activity, other and less dramatic interventions can be just as effective, as to prepare for a walk every day. The point of describing the object's fluid identity is to open up "an ontological policy ", the recognition of the reality of diversity makes it possible to make a choice between different interventions in practice.

Towards an interdisciplinary understanding of ICT and health

Several studies of ICT in the health sector have drawn on the theoretical and methodological resources we have presented here. The researchers that we introduce below have located their work somewhere between three relatively established disciplines, which have their own journals and conferences: system development and/or information systems (IS), computer-supported collaboration (CSCW), and science and technology studies (STS)[13]. As a basis for our own work we highlight three key insights such studies have contributed to. First, we learned that technology is "actively participating" in work and change processes. Second, the introduction of new technology is, therefore, a fundamentally unpredictable learning and change process, in which technologies, organizations, practices and knowledge change. Thirdly, handling and managing the implementation process is not trivial, yet studies have shown that some strategies are more successful than others.

[13] This is far from an exhaustive presentation of the research in the field. For a broader discussion, see Greenhalgh, Potts, Wong, et al, (2008) who have undertaken a systematic review of research on EPRs in healthcare organizations.

Technology is an "active participant" in work and change processes

We do not believe in dividing the reality in, respectively, social and technical parts, and then try to get them to fit together. Our starting point is a more radical understanding based on insights from science and technology studies, a rejection of the dichotomy between technological determinism and social essentialism. Technology and organization, tools and work are in such a close and intertwined relationship with each other that it is not possible, or not useful to divide it. Technology is both a mean and an output, it is both the cause and the effect, it is both shaped by us, and it shapes us and our activities. The Dutch physician and researcher Marc Berg has formulated a "relational" understanding of health ICT (Berg, 1997, 2004). In one of his articles on electronic medical record (Berg, 1999) he argues that we should not understand the EPR (and ICT generally) as a pre-defined technology that more or less automatically will bring changes in the health care system, organization and work. Neither should we think of EPR as a flexible tool that we can design so that it just supports health care work. It is therefore neither a neutral tool nor an autonomous "driver" that brings change. Berg presents instead the EPR system as an active participant. Berg has observed the work at an intensive care unit in a Dutch hospital, and provides ethnographic descriptions of work done on, with and around a medication form and a fluid balance form, as paper forms initially and as new electronic forms. He shows how these forms take part in the reading and writing processes where there is more going on than health workers "using" technology. Reading, writing and sharing information is the result of a shared, collective process between people and technology. Technology (in the form of these forms) is actively mediating, Berg says: it's not just that they passively support communication and documentation, but they also change what communication and documentation are - these activities gain a new character.

Introduction of a new technology is long lasting and unpredictable process

Given such understanding of technology implies that to introduce EPR (or other ICT systems) therefore could not be seen as a simple digitalization or automation of work processes. It is rather a *transformation*; a change in both content and organization of work. Such changes can take time. Berg and Winthereik (2004) says that the paper-based infrastructure in hospitals related to the medical record has evolved and been adapted and refined during a period of over a hundred years. Changing such a complicated network of things, practices, competencies and rules, that have arisen and aligned over time, is not easy. If there are changes, it may take a long time before consequences are detected and handled. It is this aspect of introducing technology we must be able to understand better, argues Berg (1997). Rather than looking generally for "the effect" of EPR implementation, we must compare and evaluate the specific impact these processes trigger. Signe Vikkelsø (formerly Svenningsen) is a Danish researcher who has followed this view of EHR implementation. In her doctoral work (Svenningsen 2003, see also Vikkelsø 2005), she studied how work practices were modified in connection with the EPR implementation. She showed how these changes surrounding the introduction of the new technology were not one-dimensional (for the better or worse) but diverse and multidimensional. Not all changes were planned or desired. This makes it difficult to compare before and after situation, and to evaluate the usefulness of EPR and other technologies, Vikkelsø suggests that we must study the specific changes as they happen and what the consequences of those means for all parties involved.

Handling and management of design and implementation processes

When the technology is an active "co-creator" of the new practice, and when the introduction process is lengthy, unpredictable and consists of changes along several dimensions, it is not easy to plan and manage these processes. Many of the works within this tradition reported on projects that did not run as they should, and of visions that were not realized. Researchers have accessed and investigated why things did not go according to plans, and often they have been questioning the established truths about what is the right approach. There is for example a significant literature that discusses standards and standardization as both solution and problem. Usually standardization is presented as a solution to situations where one has different systems, different needs and interests, and as an unquestioned way for governments to decide how things should be. However, this is not easy to achieve.

First, standardization is rarely motivated by daily and local needs, rather by problems that arise when one goes beyond the local context. This happens when one has to retrieve information from different systems, or when new players should work together and there is a need to agree on data format, terminology and procedures. If one has to share information outside the context in which it was produced, it should follow a standard, but as Berg and Goorman (1999) show, medical information is to a large extent context-dependent. The documentation used is linked to the immediate situation, and the information is often concise and specific. For the aim of reusing of information these aspects are perceived as causing low quality data, even if the documentation is adequate for its primary area of use - information exchange and coordination in an actual treatment situation. Similarly, other studies show that the individual health worker may not perceive fragmentation and diversity in the data a problem in practice, as one would expect (Ellingsen & Monteiro, 2003a). The health worker is well trained in collecting and evaluating information from many different sources, and he often needs a flexibility that strictly standardized systems do not necessarily offer (Ellingsen & Monteiro, 2003b). There is also some resistance in the local practice against standardization.

STS scholars have discussed the understanding of standards in medicine as apolitical and value-neutral, for example, in connection with the International Classification of Diseases (ICD) (Bowker & Star, 1999), the Nursing Intervention Classification (NIC) (Bowker, Timmermans & Star, 1995), code standards in general practice (Winthereik, 2004), EHR standards (Bear, et al, 2009) and procedural standards in general (Timmermans & Berg 2003). It is illustrated specifically in relation to standards in the IT systems by Ellingsen, Monteiro and Munkvold (2007). They describe the tensions and conflicts of interest that arose because the standardization of nursing documentation was also interrelated with the wish by management for resource management and control.

How to manage such tensions? Timmermans and Berg (1997) studied how clinical research protocols from an international multi-center studies were incorporated in local clinical work.

They go so far as to say that a flexibility that allows local deviation, improvisation and adaptation to be possible is essential to get such a "universal" standard to function as intended. Others also point out that rigid standards are problematic. Wintereik and Vikkelsø (2005) discuss the Danish standard for discharge letter and warn not to refine and completely standardize it because the result, paradoxically enough, could be that less relevant clinical information would be transferred. "Flexible standards" may sounds like an oxymoron, but strategies for controlled flexibility have been concretely described, for example, by Bowker and Star (2002), Braa and Hedberg (2002), Berg (2004), and Braa, Hanseth, Heywood, et al (2007).

Moreover, it is not just to fit into local practice that standards must be flexible. Berg and Timmermans (2000) analyzes standards as active organizers - and emphasize that when a standard creates order in one place (or along one dimension) it creates disorder at the same time elsewhere (along a different dimension). Thus, standardization is not only a solution, but it can also create new problems. Trying to standardize may mean that one starts processes that have unwanted consequences. Many attempts at system and process integration have been difficult to realize, and attempts with unintended consequences took place in the Norwegian context. This message is particularly prominent in the literature based on the concept of information infrastructure (see, for example, Ciborra et al, 2000; Monteiro, 2003, Ellingsen & Monteiro, 2006, Hanseth, Jacucci, Grisot, et al, 2007; Ellingsen & Monteiro, 2008). In these studies, we find recommendations to avoid creating unnecessary complexity through what we might call the "precautionary" principles, such as flexible standards, minimal integration and adaptive strategies, including the so-called cultivation strategies, which we return to in the last chapter.

ICT and cooperation in health sector

Many of the studies in this field have studied the digitization of work tools in a local context, which has given us valuable and relevant insights. However, new problems emerge when we talk about the interaction between players. This are the challenges we increasingly will encounter when it comes to interaction through ICT. In a comprehensive systematic review of qualitative studies of electronic patient records, it is said:

> “The research to date has barely scratched the surface of what the introduction of the EPR means, at the level of finegrained detail, for a health care organization and the staff and patients who practice and interact in that setting—and still less so when the EPR is part of a large-scale regional or national program” (Greenhalgh et al, 2008, p. 754).

With this book, we want to begin to "scratch" a little bit of what “interaction with the help of ICT” means and to discuss how ICT can contribute to better cooperation.

REFERENCES

Akrich, M. (1992). The De-scription of Technical Objects. I W. Bijker & J. Law (Red.), Shaping technology/Building society (pp. 205–224). Cambridge: MIT Press.

Argyris, C. Putnam, R., & Smith, D. (1985). Action science: concepts, methods and skills for research and intervention. San Francisco: Jossey-Bass.

Asdal, K., Brenna, B., & Moser, I. (red.). (2001). Teknovitenskapelige kulturer. Oslo: Spartacus forlag.

Bansler, J. (1989). Systems Development Research in Scandinavia: Three Theoretical Schools. Scandinavian Journal of Information Systems, 1(1), 3–20.

Berg, M. (1997). Rationalizing medical work: decision-support techniques and medical practices. Cambridge: MIT Press.

Berg, M. (1999). Accumulating and Coordinating: Occasions for Information Technologies in Medical Work. Computer Supported Cooperative Work, 8(4), 373–401.

Berg, M. (red.). (2004). Health information management. London: Routledge.

Berg, M. & Goorman, E. (1999). The Contextual Nature of Medical Information. International Journal of Medical Informatics, 56(1–3), 51–60.

Berg, M. & Timmermans, S. (2000). Orders and Their Others: On the Constitution of Universalities in Medical Work. Configurations, 8(1), 31–61.

Berg, M. & Winthereik, B.R. (2004). Waiting for Godot. Episodes from the History of Patient Records. I Berg, M. (red.). Health information management (pp. 11–44). London: Routledge.

Bjerknes, G., Ehn, P., & Kyng, M. (red.). (1987). Computers and democracy. A Scandinavian challenge. Avebury: Aldershot.

Bjerknes, G. & Tone Bratteteig (1987). FLORENCE in Wonderland – Systems Develeopment with Nurses. I G. Bjerknes, P. Ehn & M. Kyng (red.), Computers and democracy. A Scandinavian challenge (pp. 279–285). Avebury: Aldershot.

Bjørn, P., Burgoyne, S., Crompton, V., MacDonald, T., Pickering, B., & Munro, S. (2009). Boundary Factors and Contextual Contingencies: Configuring Electronic Templates for Healthcare Professionals. European Journal of Information Systems, 18(5), 428–441.

Blomberg, J., Giacomi, J., Mosher, A., & Swenton-Wall, P. (1993). Ethnographic Field Methods and Their Relation to Design. In D. Schuler & A. Namioka (Red.), P Participatory Design: Principles and Practices, (pp. 123–155). Hillsdale: Lawrence Erlbaum Associates.

Bowker, G., Timmermans, S.& Star, S.L. (1995). Infrastructure and Organizational Transformation: Classifying Nurses' Work. I W. Orlikowski, G. Walsham, M. Jones, & J. De-Gross (red.), Information technology and changes in organizational work, (pp. 344–370). London: Chapman and Hall.

Bowker, G. & Star, S.L. (2002). Sorting things out. Classification and its consequences. Cambridge: The MIT Press.

Braa, J. & Hedberg, C. (2002).The Struggle for District Based Health Information Systems in South Africa, The Information Society, 18(2), 113–127.

Braa, J., Hanseth, O., Heywood, A., Mohammed, W., & Shaw, V. (2007). Developing Health Information Systems in Developing Countries: The Flexible Standards Strategy. MIS Quarterly, 31(2), 381–402.

Bratteteig, T. (2004). Making change. Dealing with relations between design and use. Dr. Philos-avhandling, Institutt for Informatikk, Universitetet i Oslo.

Braverman, H. (1974). Labor and monopoly capital: the degradation of work in the twentieth century. New York: Monthly Review Press.

Button, G.(2000). The Ethnographic Tradition and Design. Design Studies, 21(4), 319–332.

Bødker, S., Ehn, P., Kammersgaard, J., Kyng, M., & Sundblad, Y. (1987): A Utopian Experience in Design of Powerful Computer Based Tools for Skilled Graphic Workers. I G. Bjerknes, P. Ehn, & M. Kyng (red.), Computers and democracy. A Scandinavian challenge. (pp. 251–278). Avebury: Aldershot.

Bødker, S., Ehn, P., Sjøgren, D., & Sundblad,Y. (2000). Co-operative Design – Perspectives on 20 Years with the Scandinavian IT Design Model. Keynote-presentasjon, NordiCHI 2000, Stockholm, Sverige, 23.-25. oktober 2000.

Callon, M. (1986). Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay. I J. Law (red), Power, action and belief: a new sociology of knowledge? (pp.196–223). London: Routledge.

Callon, M. & Rabeharisoa, V. (2003). Research ‘in the wild’ and the Shaping of New Social Identities. Technology & Society, 25(2), 193–204.

Ciborra, C., Braa, K., Cordella, A., Dahlbom, B., Failla, A., Hanseth, O., Hepsø, V., Ljungberg, J., Monteiro, E., & Simon, K.A. (2000). From control to drift. The dynamics of corporate information infrastructures. Oxford: Oxford University Press.

Collins, R. (red.). (1994). Four sociological traditions: selected readings. New York: Oxford University Press.

De Laet, M. & Mol. A. (2000). The Zimbabwe Bush Pump. Mechanics of a Fluid Technology. Social Studies of Science, 30(2), 225–263.

Dourish, P. & Belotti, V. (1992). Awareness and Coordination in Shared Workspaces. I J. Turner & R. Kraut (red.), Proceedings of the 1992 ACM Conference on Computer-Supported Cooperative Work, (s. 107–114). Toronto: ACM,.

Ehn, P. (1988). Work-oriented design of computer artifacts. Falköping: Almqvist and Wiksell International.

Ellingsen G., Monteiro, E., & Munkvold, G. (2007). Standardization of Work: Co-constructed Practice. The Information Society, 23(5), 309–326.

Ellingsen, G. & Monteiro, E. (2003a). A Patchwork Planet: Integration and Cooperation in Hospitals. Computer Supported Cooperative Work, 12(1), 71–95.

Ellingsen, G. & Monteiro, E. (2003b). Mechanisms for Producing Working Knowledge: Enacting, Orchesterating and Organizing. Information and Organization, 13(3), 203–229.

Ellingsen, G. & Monteiro, E. (2006). Seamless Integration: Standardisation across Multiple Local Settings. Computer Supported Cooperative Work, 15(5–6), 443–466.

Ellingsen, G. & Monteiro, E. (2008). The Organizing Vision of Integrated Health Information Systems. Health Informatics Journal, 14(3), 223–236.

Forsythe, D. (1999). «Its Just a Matter of Common Sense»: Ethnography as invisible Work. Computer Supported Cooperative Work, 8(1–2), 127–145.

Geertz, C. (1973). The interpretation of cultures. New York: Basic Books.

Gerson, E. M. & Star, S.L. (1986). Analyzing due process in the workplace. ACM Transactions on Office Information Systems, 4(3), 257–270.

Greatbatch, D., Heath, C., Campion, P. & Luff, P. (1995). How do Desk-top Computers Affect the Doctor-Patient Interaction? Family Practice, 12 (1), 32–36.

Greenbaum, J. & Kyng. M. (red.). (1991). Design at work: cooperative design of computer systems. Hillsdale: Lawrence Erlbaum Associates.

Greenbaum, J. (1995). Windows on the workplace. Computers, jobs, and the organization of office work in the late twentieth century. New York: Monthly Review Press.

Greenhalgh, T., Potts, H., Wong, G., Bark, P., & Swinglehurst, D. (2009). Tensions and Paradoxes in Electronic Patient Record Research: A Systematic Literature Review Using the Meta-narrative Method. The Milbank Quarterly, 87(4), 729–788.

Gustavsen, B. (1990). Strategier for utvikling i arbeidslivet. Oslo: TANO.

Hanseth, O., Jacucci, E., Grisot, M., & Aanestad, M. (2007). Reflexive Integration in the Development and Implementation of an Electronic Patient Record System. I O. Hanseth & C. Ciborra (red.), Risk, complexity and ICT. Cheltenham: Edward Elgar Publishing.

Harper, R. & Hughes, J. (1993). 'What a F-ing System! Send 'em all to the same place and then expect us to stop 'em hitting': Making Technology Work in Air Traffic Control. In G. Button, (red.), Technology in working order: Studies in work, interaction and technology (pp. 127–144). London: Routledge.

Hartswood, M., Procter, R., Rouncefield, M., Slack, R., Soutter, J., & Voss, A. (2003). 'Repairing' the Machine: a Case Study of the Evaluation of Computer-aided Detection Tools in Breast Screening. In K. Kuutti, E.H. Karsten, G. Fitzpatrick, P. Dourish, & K. Schmidt (red.), Proceedings of the Eighth European Conference on Computer Supported Cooperative Work (ECSCW) (s. 375–394). Dordrecht: Springer.

Heath, C. & Luff, P. (1992). Collaboration and Control. Crisis Management and Multimedia Technology in London Underground Line Control Rooms. Computer Supported Cooperative Work, 1(1–2), 69–94.

Heath, C. (1986). Body movement and speech in medical interaction. Cambridge: Cambridge University Press.

Hughes, J., King, V., Rodden, T. & Anderson, H. (1994). Moving Out From the Control Room: Ethnography in Systems Design. I J.B Smith, F.D Smith, & T.H Malone (red.), Proceedings from CSCW'94 (pp. 429–439). Chapel Hill: ACM.

Jordan, B. (1996). Ethnographic Workplace Studies and Computer Supported Cooperative Work. In D. Shapiro, M. Tauber, & R.Traunmüller (red.), The design of computer-supported cooperative work and groupware systems (pp. 17–42). Amsterdam: Elsevier Science.

Karasti, H. (2001). Increasing sensitivity towards everyday work practice in system design. PhDavhandling, University of Oulu, Finland.

Kuhn, T. (1962). The structure of scientific revolutions. Chicago: University of Chicago Press.

Latour, B. (1987). Science in action. Cambridge: Harvard University Press.

Law, J. (1987). Technology and Heterogeneous Engineering: the Case of Portuguese Expansion.

I W. Bijker, T.P. Hughes, & T. Pinch (red.), The social construction of technological systems: New directions in the sociology and history of technology (pp. 111–134). Cambridge: MIT Press.

Law, J. (1994). Organizing modernity. Oxford: Blackwell.

Law, J. (1999). After ANT: Complexity, naming and topology. I J. Law & J. Hassard, (Red.), Actor network theory and after (s.1–14). Oxford: Wiley-Blackwell.

Law, J. (2002). Aircraft stories: decentering the object in technoscience. Durham: Duke University Press.

Law, J. (2008). On sociology and STS. The Sociological Review, 56(4), 623–649.

Martin, D., Bowers, J., & Wastell, D.G. (1997). The Interactional Affordances of Technology: An Ethnography of Human-Computer Interaction in an Ambulance Control Centre. I H.W.Thimbleby, B. O'Conaill, & P. Thomas (red.), Proceedings of HCI on People and Computers XII (s. 263–281). London: Springer Verlag.

Mol, A. (2002). The body multiple: ontology in medical practice. Durham: Duke University Press.

Mol, A. & Berg, M. (red.). (1998). Differences in medicine: unraveling practices, techniques, and bodies. Durham: Duke University Press.

Monteiro, E. (2003): Integrating Health Information Systems. A Critical Appraisal. Methods of Information in Medicine, 42(4), 428–432.

Moser, I. (2006). Disability and the Promises of Technology: Technology, Subjectivity and Embodiment within an Order of the Normal. Information, Communication & Society, 9(3), 373–395.

Muller, M. & Kuhn, S. (1993). Participatory Design. Communications of the ACM, 36(6), 24–28.

Nygaard, K. & Bergo, O. (1974). Planlegging, styring og databehandling. Grunnbok for fagbevegelsen. Del 1: Innføring og Del 2: Datamaskiner, systemer og språk. Oslo: Tiden Norsk forlag i samarbeid med Arbeidernes opplysningsfond.

Olerup, A. (1989). Socio-technical Designs of Computer-assisted Work: A Discussion of the ETHICS and Tavistock Approaches. Scandinavian Journal of Information Systems, 1(1), 43–71.

Oudshoorn, N. & Pinch, T. (2003). How users matter: the co-construction of users and technology. Cambridge: MIT Press.

Pors, J.K., Henriksen, D., Winthereik, B.R., & Berg, M. (2002). Challenging Divisions. Exploring the Intersections of Ethnography and Intervention in IS Research. Scandinavian Journal of Information Systems, 14(2), 3–7.

Robinson, M. (1993). Design for Unanticipated Use. I G. de Michelis, C. Simone, & K. Schmidt (Red.), Proceedings of the Third European Conference on Computer-Supported Cooperative Work (ECSCW) (pp. 187–202). Dordrecht: Kluwer.

Rohracher, H. (red.). (2005). User involvement in innovation processes. Strategies and limitations from a socio-technical perspective. Munich: Profil-Verlag.

Schmidt, K. & Bannon, L. (1992). Taking CSCW Seriously: Supporting rticulation Work. Computer Supported Cooperative Work, 1(1–2), 7–40.

Schmidt, K. (2000). The Critical Role of Workplace Studies in CSCW. I P. Luff, J. Hindmarsh, & C. Heath (red.), Workplace studies: recovering work practice and informing system design (pp. 141–149). Cambridge: Cambridge University Press.

Schuler, D. & Namioka, A. (red.). (1993). Participatory design. Principles and practices. Hillsdale: Lawrence Erlbaum Associates.

Shapin, S. (1995). Trust, Honesty and the Authority of Science. I R.E. Bulger, E.M. Bobby, & H.V. Fineberg (red.), Society's choices: social and ethical decision making in biomedicine (pp. 388–408). Washington: National Academy Press.

Star, S. L. (1991). Power, Technology and the Phenomenology of the Conventions: on Being Allergic to Onions. I J. Law (red.), A Sociology of monsters: essays on power, technology and domination (pp.26–56). London: Routledge.

Strauss, A., Fagerhaugh, S., Suczek, B., & Wiener. C. (1985). Social organization of medical work. Chicago: The University of Chicago Press.

Suchman, L. (1987). Plans and situated action: the problem of human-machine communication. Cambridge: Cambridge University Press.

Suchman, L. (1994). Supporting Articulation Work: Aspects of a Feminist Practice of Office Technology Production. In R. Kling (red.), Computerization and controversy (pp. 407–423). San Diego: Academic Press.

Suchman, L. (2007). Human-machine reconfigurations. Plans and situated actions 2nd edition. Cambridge: Cambridge University Press.

Suchman, L. & Trigg, R.H. (1991). Understanding Practice: Video as a Medium for Reflection and Design. I J. Greenbaum & M. Kyng (red.), Design at work: cooperative design of computer systems (pp. 65–89). Hillsdale: Lawrence Erlbaum Associates.

Svenningsen, S. (2003). Electronic patient records and medical practice. Re-organization of roles, responsibilities and risks. PhD-avhandling, Handelshøjskolen i København, Danmark.

Thorsrud, E. og Emery, F. (1969). Mot en ny bedriftsorganisasjon – eksperimenter i industrielt demokrati. Oslo: Tanum.

Timmermans, S. & Berg, M. (1997). Standardization in Action. Achieving Local Universality Through Medical Protocols. Social Studies of Science, 27(2), 273–305.

Timmermans, S. & Berg, M. (2003). The gold standard. The challenge of evidence-based medicine and standardization in healthcare. Philadelphia: Temple University Press.

Tjora, A. (1997). Caring machines. Emerging practices of work and coordination in the use of medical emergency communication technology. Dr.Polit-avhandling i sosiologi, NTNU.

Tjora, A. (2004). Maintaining Redundancy in the Coordination of Medical Emergencies. I J. Herbsleb & G. Olsson (red.), Proceedings of the 2004 ACM Conference on Computer Supported Cooperative Work (pp. 132–141). New York: ACM.

Trist, E. & Bamforth. K. (1951). Some Social and Psychological Consequences of the Longwall Method of Coal Getting. Human Relations, 4(3), 3–38.

Vikkelsø, S. (2005). Subtle Redistribution of Work, Attention and Risks: Electronic Patient Records and Organisational Consequences. Scandinavian Journal of Information Systems, 17(1), 3–30.

Vinck, D. (red.). (2003). Everyday engineering. Ethnography of design and innovation. Cambridge: MIT Press.

Winthereik, B. R. (2004). Connecting practices. A study of electronic patient records at work in primary health care. PhD-avhandling, Erasmus Universitetet, Rotterdam, Nederland.

Winthereik, B. R. & Vikkelsø, S. (2005). ICT and Integrated Care: Some Dilemmas of Standardising Inter-Organisational Communication. Computer Supported Cooperative Work 14(1), 43–67.