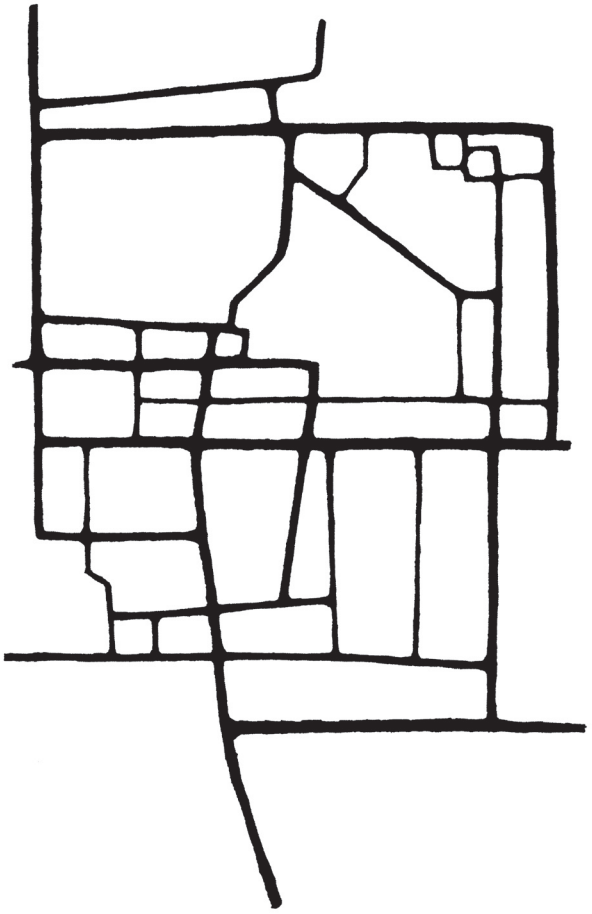

Blekinge Institute of Technology
Dissertion Series No 2004:02
ISSN 1650-2159
ISBN 91-7295-037-4

Angels in Unstable Sociomaterial Relations: Stories of Information Technology

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Jacket illustration: ©Lina Nordenström
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School of Technoculture, Humanities and Planning
Division of Technoscience Studies
Publisher: Blekinge Institute of Technology
Printed by Kaserntryckeriet, Karlskrona, Sweden 2004
ISBN 91-7295-037-4

Content

Förord

Några viktiga saker ska sägas.

Jag har svårt att tro att ett arbete som pågått i så många år tar slut. När jag säger arbete så menar jag förstås att ta fram en fysisk produkt; en avhandling i form av en bok. Men det har funnits så mycket annat som jag räknar som avhandlingsarbete. Kurser, seminarier, konferenser kanske som självklara delar. Men också andra delar som egentligen också borde diskuteras och utvärderas. Att vara med och utveckla nya utbildningsprogram. Att delta i nätverksmöten med representanter från industrier och callcenterföretag. Att studera yrkeskunnande på företag. Summan av kardemumman: att ha fått vara en doktorand inom teknovetenskapliga studier vid Blekinge tekniska högskola har varit ett äventyr, en utmaning, en belöning. Att färdigställa en avhandling är möjligt, men att färdigställa en resa är en omöjlighet. En omöjlighet som en möjlighet.

Att skriva är en pina. Orden vill inte komma till mig. Det gör ont i kroppen. De tråkigaste uppgifterna – diska, tvätta, städa, sortera – känns plötsligt lockande. Kaffepauserna blir längre och längre. Hur väl känner jag inte igen detta: ”*efter ännu en dag när jag inte fått någonting skrivet drabbas jag av tanken på det – av allt jag kunde skrivit i dag har jag inte skrivit någonting. Ingenting. Ännu än dag utan resultat, ännu en av alla dessa dagar när eftertankens eländiga blekhet slår till innan tanken hunnit bli tänkt, ännu en av alla dessa dagar när jag ingenting har fått gjort. Inte någonting.*” (Malmsten, 2003). Det finns förväntingar i luften, klockan tickar, månaderna försvinner, deadline i morgon. Bra det, annars blir ingenting gjort. Men hur jag ska skriva? En akademisk avhandling? ”*[…] Det tar sig, sa Emma. Skriv nu alltsammans på hexameter. Och kom ihåg att i ett ordentligt sorgespel i gammal god stil ska alla vara släkt med varandra. Men hur kan de vara så arga på varandra fast de är släkt? frågade muminmamman försiktigt. Och där finns inte enda prinsessa? Kan det inte få sluta bra? Det är så sorgligt när folk dör. Det är ett sorgespel, kära du, sa muminpappan. Och då måste nån dö i slutet. Helst alla utom en och kanske den också. Det har Emma sagt. Pax för mig att dö i slutet, sa Misan. Och får jag vara den som slår ihjäl Misan? bad Mymlans dotter. Jag trodde att Muminpappan skulle skriva en detektivhistoria, sa Homsan besviken. Nånting där alla blir misstänkta och man har en massa trevliga ledtrådar att fundera över. Mumintrollets pappa reste sig sårad och samlade ihop sina papper.*” (Jansson, 1980). Jag har kämpat med mina hexametrar, prinsessor, mördare och slut. Att skriva en avhandling har mycket handlat om att hitta en balans med att själv få vara med och delta i texten och att ingå i ett forskarsamfund med sina traditioner, regler och praktiker. En skakig upplevelse. Det vet de som (försökt) handlett mig.

Jag undrar om det någonsin skulle ha blivit en avhandling utan alla dessa fantastiska människor som gett mig tid, som orkat prata med mig, som tålamodigt svarat på mina frågor. Och alla dessa projekt, och vardagens arbete. Och politiska dokument. Inte visste jag innan hur spännande de kan vara. Att ständigt förvåna sig över det som tas för givet, det som nästan inte finns. Att lära sig att bli förvånad: ”*…tro aldrig när du tittar på en karta att det inte finns nånting där åt oss, för du kan stöta på en överraskning. Jag har varit här i trettiofem år och jag är fortfarande förvånad över vad vi hittar och var vi hittar det*” (Welsh, 2003). Hur litet är det lilla? Hur enkelt är det enkla? Att lära sig att ställa frågor – det är det som avhandlingsarbetet (också) har handlat om, i hög grad.

Till sist. Man (läs: jag) kan bli mycket självcentrerad, i alla fall vid slutstadiet av avhandlingsarbetet. När folk ringer och frågar hur det går, kan jag lätt prata på och älta, och svära och tycka synd om mig själv. Avhandligen skulle nog aldrig ha blivit färdig utan alla dessa, som brytt sig och som stått ut. Att tacka sina nära och kära kan kännas som en kliché – vi har väl alla sett Oscarsgalan? Hur patetiskt det än kan låta så är avhandlingsarbete inte möjligt utan andra människors närvaro och delaktighet. Jag vill ge en kram till mina handledare, Lena och Marja. Lena – tack för din entusiasm och att du skapat plats för tänkande och görande. Marja – ihan erikseen tuhannet kiitokset lujuudestasi ja pehmeydestäsi. Tillsammans har ni varit stödjande och kritiska. Det tackar jag för. Jag har behövt både morot och piska. Mina teknovetenskapliga vänner – tack för samtal. Ett extratack till Christina B. – skulle detta ha gått utan dig? Och till Jan – hur många gånger har du inte lånat mig dina öron. Mina e-governmentvänner – tack för gränsöverskridningar, inte alltid smärtfria men nödvändiga. Yvonne och Sara – tack inte bara för slutseminariet utan också för all vägledning under dessa år. Mina informanter – ett torftigt ord som döljer mängder av änglar. Ni är de viktigaste. Mina fika- och lunchvänner – solsken i vardagen. En viktig person – Christina M., min mentor, med dig diskuterar jag inte bara feministisk teknovetenskap, utan njuter också av livets andra väsentligheter (shopping). Gunnel – dina kommentarer har alltid tillhört de värdefullaste. My ITDG-friends – to meet you has been an intellectual challenge. But our meetings have also given warmth that only meeting with friends can give. With you I have learned that borders that come in many shapes and both can, are and should be transgressed. Vännerna på biblioteket – ni är med i min avhandling, oftast dock kamouflerade som referenser. Jane och Jenny – tack för engelskan. Lina – tack för bilden, som kom in i mitt liv när jag försiktigt hade börjat tvivla på nödvändigheten av stablitet, men fortfarande inte hade hittat ord för att tala om instabilitet. Marie – tack för så att det hela blev vackert. Och tack alla andra som möjliggör vardagens sociomaterialla relationer där mitt arbete också ingår. Och Kent och Svea (och Gustav som inte fick var med hela vägen) – det finns inga ord. Men ni vet.

Tack till er alla med en hälsning från Mumindalen "*[…] Jag vill absolut ha med ett lejon, sa muminpappan trumpet. Han ska skriva hexameter! Hexameter! Inte rimma. Vad menar du, hexameter, sa pappan. Ja såhär: Tamta-ratam-tarara-tara-tam-tam-tamtara-tam-tam, förklarade Emma. Muminpappan klarnade upp. Menar du: Rädsla-jagaldrigharkänt-ochett lej-onjaggla-deligt nackar? frågade han. [...] Om ni inte tycker om mitt skådespel kan ni göra ett nytt själva, sa han. Älskling, sa mumintrollets mamma. Vi tycker det är underbart. Gör vi inte? Jodå, sa allesammans. Där ser du, sa mamman. Alla tycker om det. Bara du ändrar på innehållet och skrivsättet lite grand. Jag ska se till att ingen stör dig och du ska få hela karamellskålen bredvid dig när du arbetar! Nåja, sa muminpappan. Men lejonet ska med! Naturligtvis ska lejonet med, sa mamman. Muminpappan arbetade och arbetade. Ingen talade eller rörde sig. Så fort ett papper var fullskrivet läste han upp det. Mumintrollets mamma fyllde på karameller hela tiden. Alla var upphetsade och förväntansfulla.*" (Jansson, 1980).

Ronneby 2004-04-14

Pirjo

LITTERATUR:
Jansson, T. (1980) Farlig midsommar. Stockholm: AWE/GEBERS.
Malmsten, B. (2003) Det är fortfarande ingen ordning på mina papper. Stockholm: Albert Bonniers förlag.
Welsh, L. (2003) Det dolda rummet [The Cutting Room]. Stockholm: Tivoli.

Part A – Prologue

To the Reader

As the first point of departure, research questions, research methods and overall structure of the thesis are presented (see Part A, Chapter 1 'Introduction') in order to assist the reader to grasp the basic ideas, the 'why and how' of the thesis.

The starting point is the autobiographical discussion of how my professional life got connected to information technology from the middle of the 1980s and how information technology at the same time both preserved and radically changed my work practices. An important dimension is also how everyday working life pushed me to articulate questions which demanded time, space and aspects of theoretical knowledge that did not exist close to me. In my case, the way forward was to take a step aside and to enter an academic milieu, the Blekinge Institute of Technology and especially to the research milieu provided by the division of Technoscience Studies with its focus on feminist technoscience research. To take one's own experiences to an academic milieu and to translate these experiences to research is not an easy task. How to find connections and linkages between language of experiences and language of research is a question that I am still occupied with. How to maintain the respect for experiences and not look upon them as 'stepdaughters' in a milieu based on analysis and theories is of course as difficult and challenging. After introducing my personal IT-history I move further to articulate research questions I have studied concerning arenas and actors of information technology, connected to methodological and also political questions. I also discuss my travelling companions giving inspiration but also arguing, troubling, teasing, irritating, provoking. I start with a discussion of some of the main strands of feminist technology and technoscience studies. Then I briefly present the most delightful travel companions, figurations without distinct contours, which I have found in feminist research: cartography, nomad, diffraction and implosion. The figurations ask unexpected questions. They also make wild combinations when they travel both to my own experiences and to the material from the interviews I conducted when working with the dissertation. Besides thinking methods of feminist guiding figurations, I also discuss ethnographically inspired research methods.

The second point of departure is Actor-Network Theory (ANT) and Actor-Network Theory and After (ANTa) (see Part A, Chapter 2 'From Networks to Fluids and Fires – Actor-Network Theory as an Analytical Perspective') providing analytical and methodological perspectives when I worked with empirical material (as presented in Part B 'Stories of Information Technology'). This chapter contains a chronological presentation of some of the key concepts of ANT/ANTa. It also discusses how the classical ANT-perspective has changed during the last years from being a theory of networks to being a theory of other kinds of spaces such as fluid and fire ones.

The third and last point of departure in the prologue contains two chapters, Chapter 3 'Women – Insiders and/or Outsiders of Information Technology' and Chapter 4 'Living in the 'Belly of the Beast' – Doing Feminist IT Research'. In the first of these two

articles I want to position myself in the field of Swedish gender equality and information technology debate. The second article is written as a mutual project with two of my colleagues and aims to discuss the process of building up feminist technoscience research at a technical faculty at a technical university.

[Translations from Swedish to English are made by the author.]

Chapter 1. Introduction

My aim with writing stories of information technology has been to investigate the black box[1] of information technology. Investigating includes attempts at opening. Concepts that are usually taken for granted, such as the very notion of information technology in my case, can be explored, queried, transgressed, blurred and opened up. The key to the black box is provided by the projects and practices studied and presented together with the methodological and analytical perspectives provided by feminist figurations, feminist technology and technoscience studies and Actor-Network Theory (ANT) and its subsequent development Actor-Network Theory and After (ANTa).

My main interest is studying processes where people, politics and technology work together. The focus has been on the relations between the actors that shape information technology. In order to be meaningful and to acquire meanings, information technology is done in heterogeneous sociomaterial relations where humans and non-humans work together. Information technology travels, it is constantly on the move and it comes in many different shapes. The stories told in this dissertation have been ordered chronologically, and one can notice a discernible shift, which took place in the space of only a few years, that separates the stories from each other: from being an exotic technology, information technology has become a more mundane part of our everyday practices and everyday technologies (see e. g. Michael, 2000). The stories related in this dissertation are about everyday practices, where information technology is continuously shaped and created. 'Everyday' in my case is mostly everyday work done in the public sector. The public sector is a space where things are both constantly and rapidly changing. The public sector is a space for a dialogue between national politics and local implementations. The hopes and dreams of citizenship articulated in IT-political texts are translated into the public sector IT practices.

I have deliberately chosen to tell stories from seemingly small projects and practices for one main reason. As a result of my earlier experiences, I am convinced that 'everyday' is not only routines re-producing procedures, practices and services inside firm and static organisational and political structures; rather, 'everyday' holds a rich dimension of border transgressions with a multiplicity of voices and layers.[2] 'Everyday' is a space for actors to make information technology their own, to situate it in local practices (see also e. g. Eriksson & Vehviläinen, 1999, Talja & Tuuva, 2003). As I hope my stories show, information technology is also a space where people that previously we would probably have called users are now taking more and more space as developers and designers of information technology.[3]

[1] "When a machine runs efficiently, when a matter of fact is settled, one need focus only on its inputs and outputs and not on its internal complexity." (Latour, 1999, p. 304)

[2] I do not intend to discuss the notion of everyday extensively here, but rather use it in a more common-sense understanding. An interesting summary of how 'everyday' is approached from a research perspective, especially in social studies, is provided by Knuuttila, 2003.

[3] See discussions that have taken place in the field of the Scandinavian approach to systems design: Participatory design, e. g. Bjerknes & Bratteteig, 1995

A.1 Here we are far away from the grand narrative of information technology – as both shaping and shaped by western societies – as a creator of welfare, constant development and success (see e. g. Liedman, 1997). We are also far away from the fixed definitions of information technology provided for example by the Swedish government in the late 1990s (see e. g. Regeringens proposition 1999/2000:86). In my understanding, information technology is always partial, located and situated (see e. g. Haraway, 1991).

The feminist nomadic technoscience researcher is not satisfied to leave the exploration at the stage of deconstruction and drawing maps, no matter how diffracted[4] they might be (see Braidotti, 1994, Haraway, 2000, Mörtberg, 2003). She does not consider her work done when she has opened up the black box of information technology, but goes on to ask whether the black box could be rearranged. How to move from deconstruction to (re)construction is the key issue for the concluding discussion of my dissertation.

I see my work on this doctoral thesis as travelling and visiting places. In choosing the metaphor of travelling, I want to emphasise that the work has been and still is an ongoing process with some identifiable points of departure, stops and touchdowns and includes some directions and ideas for further travel. At the same time, working on a doctoral thesis is concrete work of – no matter how much energy you put into thinking of research as a fluid process – reading, writing, collecting material, analysing, discussing and above all making choices. Some directions seem to be more important than others, some directions more lucrative and seductive than others, and some directions and choices are more practical and convenient than others.

In the following, I will present how I have implemented the travelling metaphor during the research process and I will also explain which concrete directions and choices have guided me in my travel. Hopefully, this will facilitate the reading and also encourage the readers to consider their own travels and maps. Questions connected to research questions and methods are discussed in connection with each of the stories in part B 'Stories of Information Technology' and also in the last part of the thesis, Part C 'The Epilogue'. As a starting point, I will briefly present three paragraphs as a guiding road map, which I hope will help the reader follow my process and efforts and which at the same time presents my research questions, the research methods and the structure of the thesis.

The research questions

Phase 1 – Computers, Experiences and Dreams – The first questions

The first step of the travelling was taken from my experiences as a librarian starting to work with what in the middle of the 80s was called computers and computerization and which later on more and more frequently was named as information technology.

[4] See the discussion on pp. 29-30

So the story starts eighteen years ago. My very first 'computer' consisted of a terminal with flickering neon green letters and a black screen. With the help of this machine you could access information sources and open the door the big wide world. It felt as if clients at a small municipal library suddenly had the same right to information as urban dwellers. It was soon the end of filing cards written out on an electric typewriter with an eraser, the Detroit borrowing system with small pastel-coloured book slips, reservation clips and hand-written library cards; computers were to change the entire library administrative system. From our experiences and computers was woven a dream of a system which would encompass several municipalities sharing the same catalogue, a common lending system, a common interlibrary loan system and a mutual purchasing policy.

In 1988, computers in my world were still mere terminals; large, independent writing terminals. The latter were connected to expensive Northamerican literary databases. There were also small computer terminals which had the appearance of travelling typewriters with two large, black rubber ears which, together with a telephone, performed the function of a modem. The same year (1988), I started work at a computerised library, the first of its kind in a north-Swedish municipality. As a result, we were given access to three beige-coloured terminals, a scanner pen and a matrix printer; in other words, we had a thoroughly modern on-line library administrative system. Two years later, at Lund University, I finally got the opportunity to work with a real personal computer, a really sweet if grey Apple. To begin with my relationship with the new machine was somewhat cool and wary. It gradually turned, however, into a real passion, at least from my side! My Apple allowed me to produce filing cards, search in databases, write articles, produce the layout for a magazine and use the Internet.

Internet had arrived at Lund University and it arrived also to my office at the beginning of the 1990s. The university library organised a demonstration of something called Mosaic and World Wide Web. We sat in the cellar, a group of curious onlookers, watching pictures which showed everything from birds to skin diseases and library buildings. The pictures were in no particular order and came in a rush. I couldn't understand how the technique was possible, and I certainly didn't understand what the point of it was. To those who asked me afterwards what the demonstration was like I replied that it was probably really good but that I understood very little. Despite the somewhat cautious, indeed negative beginning, I was soon to become a real advocater of the opportunities offered by e-mail, news groups and World Wide Web. I was right in the middle of a revolution which not only changed concepts and names attached to computers and automatic data processing but also the very way in which computers and networks were used. The revolution encompassed machines, software, data communication, communication between people and our very daily lives. Many, and in particular the feminist researchers with whom I was working, were not at all enthusiastic; indeed, they were rather sceptical towards computers in general and the Internet in particular. Those of us who were convinced as to the usefulness of the Internet as a source of information asked why not provide more organised demonstrations and teaching sessions. No sooner said than done! The very first Internet courses ever were organised at Lund University. The number of courses gradually increased. In the

county of Blekinge in southeastern Sweden, to which I later moved, the target groups of such courses varied from librarians to teachers, healthcare workers and municipal politicians.

The Internet gradually evolved into a phenomenon which represented another concept, namely that of the information society. This led to a consideration of the discrepancies between the "haves and have-nots" as a political problem. People were concerned about the inequality of opportunity when it came to access to Internet and computers in general. Those considered outsiders were identical with the groups normally regarded as particularly vulnerable or neglected i.e., women, disabled people and immigrants. An EU-financed project known as Dialogue was created in response to this concern. The municipality of Ronneby participated with a number of sub-projects, among which 'Women Writing on the Net' was a direct result of how the lack of women was described in the world of information technology. This sub-project endeavoured to take seriously the goal formulations of the dominant information technology discourses and to interpret these from a feminist point of view. The project described in a variety of ways the actual Internet phenomenon as well as the information society and the dreams of the good life connected with these phenomena. The project also showed how an increasing number of local activities were dependent on external, often EU-based, funding and how this created a project culture which was not always able to find a foundation in existing practices, and which rarely matured into something more permanent. (Ekelin & Elovaara, 2000).

While working with computers and the Internet I often felt brave, creative and daring. Very little was known about the technical possibilities or impossibilities; computer dreams were based on thorough professional knowledge and a way of thinking which was combined with visions, stubbornness and the need to keep up with developments. The local project with which I was involved was also part of a general computer trend engulfing and sweeping through the world of libraries. In Sweden, such dreams were translated among other things into a concrete computer project known as Libris. Libris was a complete package which was "advertised as the solution to the collected problems of all research libraries: book management, lending, administration and information searches." (Olsson, 1995, p. 3). The introduction of administrative computer systems was carried out simultaneously and in parallel within the different sectors of working life e.g., at regional social insurance offices in Sweden and with the state administration in Finland. (see e.g. Göranzon, 1990, Vehviläinen, 1997). I was much affected by what was happening around me; I was also one of the creators of events in my immediate environment. I was indeed both object and co-producer.

How important was this? How should I understand and interpret this? In what ways was I a co-producer in the IT frenzy? How were my own local practices and interpretations related to official descriptions of information technology? How were the boundaries drawn up between the technical and the non-technical? How were the lines drawn between those who were "in" and those on the "outside"? What was my position in relation to these dividing lines? Were they an obstacle or could such boundaries be transgressed? How did I respond to those who were worried about

their work or their future? How did I react towards those who were sceptical? What were my reactions to technology when it proved unreliable? Why did computers and software look as they did? What was my understanding of technology? What alliances were there? The above questions reveal that I found it difficult to ally the local with the global. I had problems in relating people with machines. It was difficult to combine responsibility with enthusiasm. I wasn't sure how to relate boundaries with the successful crossing of them.

In 1998, the Blekinge Institute of Technology[5] created an IT and gender research division with its own chair. It was to this division that I moved at the beginning of 1999, bringing with me my questions and problematisations. This enabled me to start work on a doctoral dissertation in an environment, which both created the opportunity for, and affected the direction of my epistemological journey.

Phase two – From Questions to Research Questions

When I moved to the research environment, I brought with me a large number of questions from my working life experiences. Although the questions were many and although they were fairly diverse, they were thematically connected from the first moment.

The theme that has followed me through my personal experiences is the very notion of information technology. Inspired by the metaphor of the black box (see e. g. Callon & Latour, 1981, Latour, 1999) where the content is sealed in and taken for granted, my first research question was to study how information technology is shaped. Information technology comes in many shapes, and the shaping takes place in numerous arenas, places and practices. I have travelled in both the local and national arenas when studying how information technology is understood in local practices in the public sector and in national political texts, sometimes with the ensuing tension between technology and society. I have chosen to study local practices in the county of Blekinge, Sweden. I have also chosen to study the two main IT-political documents published in Sweden during my research period: the governmental bill 1995/1996:86 and the second governmental bill 1999/2000:125. I have studied these texts as formulations of the IT discourses because the discourses are not only formulated in the political texts; the texts also continue to live on in other arenas and contexts.

My second main research focus is on the actors involved in IT. The question of agency[6] is twofold: on the one hand, I have been studying actors that in many contexts are invisible and non-present. My main interest has been studying actors, such as librarians, web developers and project participants who shape IT in their daily activities. I have studied the spaces of their IT agency; how they shape information technology and how they talk about IT. The issue that I have kept returning to during my travel was the borders that are drawn in the IT scene. These borders seem to divide the scene into

[5] The university changed its name in December 2000 and was previously called the University of Karlskrona/Ronneby

[6] For discussions concerning the notion of agency, see e. g. Gardiner, J.K. (Ed.), 1995

dichotomies: insiders/outsiders, developers/users, technical/non-technical, experts/non-experts. Consequently, my research question became to investigate whether the borders really exist and if they do, whether, how and where they are transgressed. My focus was especially to see how the actors who were in a position of non-technical users acted on the IT scene when discussing the interplay between design and use of information technology. On the other hand, travelling in the IT arenas of the public sector steered by political goals, the question of agency also revealed another dimension. How do the actors participating in local projects and the national texts shape the agency of citizens through various IT implementations where technology and the notion of citizenship are constituted, shaped and materialised?

During the research project, when starting to work on my empirical material and analysing it through Actor-Network Theory (ANT) and its later development Actor-Network Theory and After (ANTa) (Part A, Chapter 2 'From Networks to Fluids and Fires'), I extended my collective of actors that had previously included only humans. Now I became increasingly interested in non-human actors, which are often taken for granted and thereby in many situations become non-visible, like many of the human actors. A further step suggested by the ANT perspective was to explore the collective efforts of humans and non-humans in co-operation in order to build up sociomaterial networks. A question for my research that developed during the research process was to investigate the contribution that the analytical and methodological perspective of ANT/ANTa could make to my study and analysis of IT practices, projects and actors.

As I stressed earlier, the research project has been a process, entailing that the places I have visited along the way have contributed more focused aspects to the original research questions. New ingredients were added that were not available from the very outset, either because they were unknown to me or because they did not yet exist when my research project started. The Scandinavian approach of systems development joined my research discussions concerning borders between designers and users of information technology. Theories of democracy and citizenship provided a sharper focus for me when I worked with the IT-political texts. Electronic government – both as a concept and as a practical implementation of information technology – was developed in the public sector during the last few years of my research project.[7]

The final research question is about the connectedness of the actors and arenas of information technology in the sociomaterial relations of information technology. This question sprang forth from my working life experiences and the practices studied and reported in the stories told in this thesis, where each story not only provides a description, but also carries its own analysis. I ask whether it would be possible to develop a perspective of integration when shaping information technology in everyday practices by using the methods of thinking provided by feminist guiding figurations together with the analytical and methodological perspective of ANT/ANTa. My intention is to discuss whether the methods of research implemented in my thesis could be adapted not only as research methods, but also as development methods in IT practices, in my case in the public sector.

In order to get a comprehensive picture of the research questions present in the thesis, it is necessary to become familiar with the six stories of information technology presented in part B of the thesis and the concluding discussion in part C.

Phase three – Questions of Implosion

If I say that my stories have contributed in a (modest) way to opening up the black box of information technology, you might ask if I want to stop here and leave the scene. Much of the recent feminist research has been both keen and excellent on deconstructing our understandings and practices (see e. g. Mörtberg, 2003), but it has "been less good as an agent for changing science"[8]. Or as the Norwegian feminist researcher Harriet Bjerrum Nielsen says in quite a mean, belittling way, there is a risk that we will "[…] end up with an endless supply of small, near-sighted studies […]" (Bjerrum Nielsen, 2000, p. 26). My reading of her words points in several directions. Partly it is a question of criticism aimed at post-structuralistic research with its strong emphasis on language and discourses. She accuses the linguistic turn of entailing that feminist research has lost sight of its roots in classical feminist issues: agency, empowerment and power. From my perspective, I would claim that the post-structuralistically oriented feminist research has provided a valuable contribution to my research by challenging the prevailing dominant understandings – we could very well call them discourses – of information technology. It has also supported my thoughts regarding the multiplicity in all the contexts where information technology is constructed, in relation to humans as well as non-humans. (See also the discussion in Mörtberg, 1997, Trojer, 2002). Another possible way of reading Bjerrum Nielsen is to focus on the word 'små' [small] and to project the word against the great western enlightenment narratives (see e. g. Liedman, 1997). Telling 'small' stories is also to take a standpoint away from the reproduction of the great narrative of information technology with all its promises of a good life.[9] My third and final reading leads my thoughts to the very issue of writing and story telling. The important elements are what we write, what and whom we write about and how we write, because stories construct the world; they are performative (Law, 2002) and therefore they are also powerful and political (see e. g. Law, 2002). Perhaps in the stories Bjerrum Nielsen chooses to call small, space is created for voices that do not have a place in the great stories.

Towards what then is feminist technoscience, where I include my own feminist IT research, striving? The term technoscience represents in itself a transgressing of a boundary. Donna Haraway writes: "I want to use technoscience to designate dense

[7] Discussions that took place in the research network "Information Technology, Transnational Democracy and Gender (ITDG, financed by NORFA, 1999-2003), with participants from the Nordic countries, Estonia, Lithuania and Northwest Russia, have contributed and influenced both the expansion and sharpening of my research questions, as has also participation in the multidisciplinary research group in the field of e-government at the Blekinge Institute of Technology.

[8] I agree with Christina Mörtberg when she says that "I do not make a great distinction between technology and science, since the borders are blurred today" (Mörtberg, 2003, p. 61). I would like to add that this also applies for sociotechnical/material relations because the borders here are just as blurred

[9] See e. g. Part B, Chapter 1 in this thesis "Discourses and Cracks" where the promises are discussed

nodes of human and nonhuman actors that are brought into alliance by the material, social, and semiotic technologies through which what will count as nature and as matters of fact gets constituted for – and by – many millions of people." (Haraway, 1997, p. 210). Technoscience is no utopia, wild dream or science fiction. We are (in) technoscience. It is possible to use the word 'we', as "all the actors in technoscience are not scientists and engineers." (Haraway, 1997, p. 210). There are many ways of participating in technoscience: as a consumer, politician, parent, librarian, citizen, patient, laboratory mouse, political text, nuclear weapon, headache tablet, cat, computer or a pair of glasses. Where does technoscience lead us when we discuss the boundaries between insiders and outsiders?

To implosion is Donna Haraway's answer. She explains: "Technoscience provokes an interest in zones of implosion, more than in boundaries, crossed or not. The most interesting question is, what forms of life survive and flourish in these dense, imploded zones?" (Haraway, 1994, p. 16). She continues: "The technical, textual, organic, historical, formal, mythic, economic, and political dimensions of entities, actions and worlds implode in the gravity well of technoscience – or perhaps any world massive enough to bend our attention, warp certainties and our lives . . . But foreground and background are relational and rhetorical matters, not binary dualisms or ontological categories . . . implosion is a claim for heterogeneous and continual construction through historically located practice, where the actors are not all human." (Haraway, 1994, p. 68).

Can implosion function as a metaphor for powerful critical thought leading to action and change? How can my research contribute to starting up implosions in several different places?

How does one create implosions in information technology? My hope is that my research can modestly contribute to a change in the current dominating understandings of information technology. By filling up the information technology map with day-to-day practices, it can help make information technology more down-to-earth. The use of the feminist technoscience perspective gives the questions of accountability and sustainability a central position.

With my solid background in working life experiences, I have also been occupied with the question of how we can create a link between theory as practised in the research context and practice as constructed in the development of information technology in and for the public sector? How can the more theoretically oriented discussions take part in the processes of change within local interpretations and practices in the field of information technology? How can we reinforce discussions about the relations between existing practical knowledges, often based on the experiences of skilled professionals, the new forms of knowledges that information technology represents, and the technological change intertwined with the organisational and political change taking place in the public sector? How can discussions about relations between existing organisational forms and the new opportunities that information technology affords be successfully developed? How could the experiences – both from my own working life and from the stories told – return to new practices? I will return to these questions more explicitly in part C of the thesis, 'The Epilogue'.

Methods of working

As a starting point, it is important to think of the question of methods as threefold, consisting of methods of collecting material, methods of thinking and methods of analysis. Of course, I remain conscious of the risks entailed by creating categories and simplifications and know that pure categorisation is neither possible nor desirable when practising research.

The question of research methods is important, and not only in terms of methods and their use as an academic skill. Of course, using research methods (especially in connection with collecting and handling research material) is a skill, and like all other skills it takes time and practice to become an expert.[10] Research methods as methods of collecting material are part of the tool kit that is available and accessible for scholars, and being familiar with and mastering the tools is as important in the research profession as it is in any other profession. However, choice of method is not only a question of tools, but is also to a great extent an epistemological question: which and whose knowledge can I approach by using the methods, and how are the methods connected to understanding the constructive nature of research processes and results? Doing feminist research, I am also highly aware of the very central issues of method/methodology/epistemology raised by a number of feminist researchers (see e. g. Harding, 1987), all the while remembering that there is "no uniform canon of feminist research principles" (Stacey, 1988, p. 21).

Ethnographically inspired methods

The main method of collecting material for my thesis was greatly inspired by ethnography, which in itself does not fit into a narrow definition. Ethnography can be understood as a descriptive study, an approach to social research, a particular method or set of methods, a literacy and writing practice, a fieldwork and a written document (Hammersley & Atkinson, 1995, Blomberg et al., 1991, Anderson, 1994, Rheinhartz, 1991, Stacey, 1998, Korvajärvi, 1998, Ely, 1993).

In my research practice, ethnography as defined by Hammersley and Atkinson comes closest to my way of doing research: "…the ethnographer participating, overtly or covertly, in people's daily lives for an extended period of time, watching what happens, listening to what is said, asking questions – in fact, collecting whatever data are available to throw light on the issues that are the focus of the research" (Hammersley & Atkinson, 1995, p. 1). In practice, and also in my practice, the researcher uses a set of qualitative methods, mostly interviews and observations, when visiting the places studied. The reason I am not satisfied simply to call my research methods 'qualitative methods', but want to link my choice of research methods more closely to ethnography is connected to the epistemological grounds of ethnography with its respect

[10] Here I use the term 'expert' as it is used by Hubert L. Dreyfus and researchers working in the Skill and Technology research field (see authors such as Göranzon, Bo, Janik, Allan)

for knowledge understood as constructed in everyday activities and by practitioners in these activities, or as George E. Marcus writes: "Ethnography is predicated upon attention to the everyday, an intimate knowledge of face-to-face communities and groups" (Marcus, 1995, p. 99).

Atkinson and Hammersley write that ethnographic studies, or the ideal form of ethnographic studies, presupposes "…participating…for an extended period of time…" (Hammersley & Atkinson, 1995, p. 1), which in my research context was not an option, because I had chosen to study distributed practices, which IT projects in most cases are. This meant that there was no single site where I could stay for an extended period of time, but the site was in many places at the same time, such as in project descriptions, public web sites, the internal project web site, protocols, project meetings, research interviews, workshops, research articles, daily newspapers, videotapes, audio tapes, videoconferences, focus group meetings, e-mails, computer program codes, software, web design, notes, talk, offices, meeting rooms. The working methods I could implement were, besides the traditional form of interviewing, to study all the other material available and accessible. This methodological approach worked extremely well with the analytical perspective of the Actor-Network Theory approach (ANT)[11] with its inclusion of non-human actors as participants in sociomaterial relations, as noted by other ethnographers inspired by the same perspective: "…my work begins with the recognition that technology development involves the construction and stabilization of a project-relevant technosocial network, a hybrid collectif of human and non-human actors in specific material and social arrangement." (Newman, 1998).

As I have already mentioned, ethnography should not be reserved (only) as a method for collecting material, but should also be understood as a methodological approach. Here I see a connection to the method of analysis I have chosen to work with, the ANT/ANTa perspective, which should not be reduced to being a mere method of analysis either, but is also a methodological approach. With respect to methodology, I see that ethnography and ANT coincide in their understanding of knowledge production as on-going constructions in everyday practices.[12]

Who am I – Insider/Outsider?

In the stories of information technology (see Part B of the thesis), I have had a special position as a researcher. The story of the writing women (see Part B, Chapter 1 'Discourses and Cracks') is based on my experiences as a project leader. The story of the library project (see Part B, Chapter 2 'Translating and Negotiating Information Technology') is partly based on my experiences as one of the initiators of the project, while the second part is based on interviews with librarians. The story of the e-democracy project (see Part B, Chapter 6 'Between Stability and Instability') is largely based on my experiences as a project member.

[11] See Methods of Analysis, p. 30 and Part A, Chapter 2

[12] See e.g. one of the classic ANT texts is Bruno Latour's and Steve Woolgar's (cop. 1986) "Laboratory Life: The Construction of Scientific Facts". Princeton, NJ: Princeton University Press.

In these cases, it is difficult to draw a line between the outsiders and the insiders. Who is the researcher and who is the researched? Julian Orr has written about photocopier technicians employed by a North-American company. Orr did his fieldwork with these technicians by accompanying them to the companies where the machines were installed, by attending informal lunch meetings and participating in more formal meetings. Orr had previously worked as a technician himself. He says: "…it is of some advantage to me in doing this research that I had worked as a technician…" (Orr, 1996, p. 6). He continues: "…my practical experience was both boon and curse. It was beneficial in that it made my presence in the field less obtrusive, since I needed fewer explanations. It was helpful in winning the trust of the technicians. However, it was a problem in analysis since my notes omitted things that were obvious in the field but are less so at a distance. I also found I had a tendency to regard certain phenomena as unremarkable which are not really so to outsiders." (Orr, 1996, p. 7). I can identify with Orr's experiences in my own research practice. Being an insider, sharing the same profession or being involved in the same project as my informants, gave me access to places where my motives and aims were not questioned.

Maja-Lisa Perby writes: "…there is a fundamental similarity in studying a culture you do not know from inside, and when you as an outsider study professional skills and try to get an insight of thoughts and associations among those who are practitioners. As an outsider you can not know what the core of the profession is." (Perby, 1995, p. 209). In my case I would say that having been an insider was a fundamentally important prerequisite for the way I have been able to write about two of the projects presented in this thesis, namely the 'Women Writing on the Net' project (see part B, Chapter 1 'Discourses and Cracks'), and the e-democracy project (see part B, Chapter 6 'Between Stability and Instability'). I have not only studied the projects in question but was also part of the project. This has of course given me situated knowledge about the things that have been going on as well as many opportunities to ask questions, not as a separate, formal interview, but as a part of the ongoing process. These questions have been both explanatory and part of the reflective and diffractive analysis.

Two of the stories (Part B, Chapter 3 'Negotiating Information Technology' and Chapter 4 'Making e-Government Happen') are written from an outsider position. The interview with the municipal web developer was intended to be the start of a longer field study at that specific municipality with observations and participation at the working places. Here I came as an outsider and a stranger to a situation that was obviously shaky and vulnerable. The reason I had chosen this specific municipality was precisely that I knew that the work on the municipality's web site was problematic. There had been stories about it in the local newspapers. Here my motives and reasons were questioned both implicitly and explicitly. There were reactions when I told them about my research project of studying how information technology gets shaped in local practices with its many actors, and I was informed that 'now we are moving on and want to put the problems behind us' (based on interviews with the municipal chiefs and employees in Winter 1999-Spring 2000). Access was denied.

Studying texts

I have also studied IT-political texts published as governmental bills in Sweden (Regeringens proposition 1995/1996:125 and Regeringens proposition 1999/2000:86). In some of the stories, I have also referred briefly to other IT-political texts, as published by Swedish political parties and both Swedish and international organisations with IT as their focus. Working with texts, I have not followed the traditional approaches of text analysis, such as content analysis, argumentation analysis, idea and ideology analysis, linguistic text analysis or discourse analysis (see e. g. Bergström & Boréus, 2000). Instead, my thematic reading choices are linked to the understanding of information technology as sociomaterial networks (see the discussion in part A, Chapter 2 'From Networks to Fluids and Fires'), which enables the regarding texts as actors taking part in the network negotiations and where the texts participate through themes that are relevant to other actors in the networks and the mutual network construction.

Methods of thinking

Feminist Technology and Technoscience Research

Since change with reference to intervention and transformation[13] is one of my research questions, I found it fruitful to investigate how early feminist technology studies could inform, inspire and contribute to my present research. I wondered what kind of paths feminist technology research had chosen for thinking of and working with alternatives and change, especially when dissociating oneself from the stories with great promises of technological happiness, which have perhaps tended to be more common on the political than the research agenda anyway. What are the alternatives that feminist technology research is looking for when it talks of and acts for 'making a difference'? Such questions are crucial in my own efforts to understand and trace the figuration of implosion for change.

In light of the approach that in the Anglo-American context is called the liberal feminist approach (see e. g. Grint & Gill, 1995, Vehviläinen, 2000) and which – at least in the Swedish context – is closely linked to research on gender equality, the 'project' has been to study the mechanisms of exclusion in the different fields of technology, with a strong focus on education. Here the change project has been to identify hindrances (both individual and structural) in order to recruit more women to technical education (see e. g. Björkman, 2002). The task of research from the liberal feminist/genderequality point of view has been to sample basic data to be used in political and administrative decision making.

The radical feminist or 'eco-feminist' approach, as it is sometimes called, advocates a women's own technology that takes its point of departure from the assumed specific needs that are the same for all women. Connected to the idea of making a difference, radical feminists have chosen to support establishing spaces for women to create their own technology. The radical/eco-feminist line has had much stronger connections to political activism and the women's movement than to academic feminist technology research. Marja Vehviläinen interprets telecottages started for women only and

[13] See the discussion on pp. 19- 21

spaces created for women in technology contexts as a part of the eco-feminist strand (Vehviläinen, 2000, p. 21). However, the aim and goal of many such activities – or at least their main goal – has not been to encourage women to create technology of their own. Rather they can be seen as part of the access politics of liberal feminism, where the goal besides access has been above all to learn computer skills in order to be able to use standard technology and public services provided by the authorities (see e. g. Ekelin & Elovaara 2000, Karasti, 2003). Nevertheless, I am willing to agree with Marja Vehviläinen that during the learning processes, there have been elements that clearly refer to the ideas of the eco/radical feminist approach to technology (see e. g. Ekelin & Elovaara, 2000, Vehviläinen, 2000).

The third strong direction of feminist technology studies can be called social and cultural studies of technology according to Marja Vehviläinen, where feminist technology studies are included in larger families of social and cultural studies of technology, such as technical determinism, social shaping of technology, actor-network theory and understanding technology as textuality (Vehviläinen, 2000, pp. 23-29). Social and cultural studies, having their abode mostly in the academic disciplines of social sciences and the humanities, have traditionally drawn their strength from theoretical and analytical perspectives and have not tended to work directly with technology development and implementations.[14] I would like to briefly mention the technology studies conducted from the cultural studies perspective by a Finnish research group (see Eriksson & Vehviläinen, 1999, Uotinen et al., 2001, Talja & Tuuva, 2003), because their studies focus on how information technology gets shaped and created through the interpretations of a multitude of actors, individual people, companies, institutions. There is nothing a priori essential in technology, which means that they reject the technical deterministic approach. Information technology becomes information technology or rather it becomes information technologies in use and by users. Users are actors also in other social and material contexts or orderings, which in turn also act in the shaping of the meanings of information technology. For my thinking, the most valuable contribution, besides the very situated shaping of information technology, lies in the fact that their stories show how being a user of information technology also has many shapes, spaces and dimensions. Through local stories, they expand dramatically the understanding of the notion of user, which should provide inspiration to other contexts of technology studies and development. Even though the focus of the Finnish studies is very close to the social shaping of technology approach, the materiality or 'the logic of bits' (Vehviläinen & Eriksson, 1999, p. 12) is visible in the stories, as it is considered one of the constructors of information technology.

In this context, it is important to note that there are many researchers that have a background in social sciences and humanities who also have directly been involved in technology production, but mainly in other arenas than academia.[15] Feminist inspired

[14] See e. g. Winner (1993), who criticises STS research for its lack of interest in working for changing technology. See also the criticism levelled at ANT (Part B, Chapter 2 'From Networks to Fluids and Fires')

[15] One of the best known locations where social scientists were involved in technology production for many years was Palo Alto Research Center, USA, a subsidiary of Xerox Corporation. See also the discussion in Rogers (1994).

and influenced research has transgressed borders and has been and still is active outside the mainstream fields of feminist technology studies, as presented above. Two main fields of interest for my purpose, where feminist research has influenced technology research, are the fields of ethnographic studies of technology (see e. g. Suchman, 1994, 2002), and the field of the Scandinavian approach of systems design and its close cousin, Computer Supported Collaborative Work (CSCW). The influences from the feminist research perspective are diverse. In rough terms, they move between discussing epistemological considerations and choosing to work more from a gender-equality perspective when reserving or rather occupying room for women's specific agency, voices, experiences and knowledges in technology development projects (see e. g. Bjerknes & Bratteteig, 1995, Karasti, 2003, Hammel, 2003, Wagner, 2003).

Lists and categorisations can never be complete, and they are often based on reductions and simplifications. The overview above comprises only a few of all the possible paths and roads that feminist technology studies have travelled. There is also always a risk with all lists and categorisations that unnecessary new borders are drawn or that old ones are maintained – even when talking about feminist technology research. This is not my intention; rather I hope through a partly historical exposé to highlight some of the questions feminist technology research has been engaged in, in order to relate, inspire, challenge and partly also provoke my present and future research.

One of the questions raised by feminist technology studies is the question of movement between different knowledge productions. Much of the early feminist technology studies, especially from the liberal feminist/gender equality and eco/radical feminist perspectives, had close connections to women's and feminist movements and women's activism (see e. g. Näslund, 2003, p. 193). This leads me to the question of the relations between practice and theory. As I emphasised so strongly earlier in the dissertation, my research is based on and finds its nourishment in my own working life experiences; the movement between different knowledge productions and producers is one of the underlying movements that takes place in my research work. In what way is it possible to construct a two-way traffic from and to academia and, as in my case, to and from the information technology practices of the public sector?

The focus of early feminist technology studies was on women as a group, either trying to find methods to include them in the mainstream technology use and production or trying to create technology rooms for women. The first story of information technology as presented in this dissertation belongs to the women-only approach. Is this approach still fruitful? Is there not a danger that creating special rooms also means creating isolation and ghettoes, which will only enforce the exclusion, which was exactly what the movement set out to fight against? Is a women-only solution even possible, when the whole notion of woman has been challenged in later feminist research? The work done by feminist technology activists and researchers leads us to think further and more widely about spaces and rooms in the context of technology use and development. What are the concrete spaces where technology is developed and used? Are all the rooms visible and self-evident in technology research and development cartographies? Another aspect that grows out of the ideas and experiences

from women-only technology forges links to the larger issues of knowledge, skill and expertise. Where and how are these issues understood and interpreted in information technology production outside women's rooms (see e. g. Vehviläinen, 1997)? An issue that is connected to the issue of knowledge, skills and expertise is the issue of visibility. What is counted as work and what is regarded as valuable work can be hidden in organisational arrangements, and the matrix of invisibilities also plays an important role in technology development, design and use (Ekelin, 2003, Star & Strauss, 1999, Suchman, 1994).

For my research, the turn that feminist technology research has taken to assume a technoscientific approach is important. Much of the technology research from a feminist technoscience approach has revolved around exploring the epistemological foundations of knowledge understandings and practices, where above all Donna Haraway's figurations of situatedness and partiality have been absolutely epoch making (Haraway, 1991). Here I see connections to Actor-Network Theory and cultural studies, at least as they are conducted in the Finnish context as discussed above.

Feminist technoscience studies is not keen to be labelled under one specific school or frame, but as I understand it, it challenges much of the present understandings, interpretations and even experiences of technology and demands re-thinking. In this re-thinking, figurations of border transgression are necessary, of which the figuration of the cyborg is one of the most powerful. The cyborg figuration invites feminist technoscience research to act in multiple places, in understanding that technology is a number of everyday practices, such as laboratories, private corporations, low-paid workplaces, politics and places where these practices get partially connected. The invitation is also an invitation to the possible and alternative futures where, as I read Donna Haraway, the future should not only be based on what we already know, but – as the cyborg tells us – as much as we need facts, we also need fiction and imagination. Border transgressions can also consist of the traditional feminist issues of knowledge, skill and power, but the real challenge is that there are no given answers and solutions to serious present problems connected to recent developments in science and technology. Furthermore, what is problematic can also at the same time be life supporting, as is exemplified in the non-linearity of the connections where humans, non-humans and border transgressors live and act (see e. g. Haraway, 1997).

Much of the work done within feminist technoscience research has been about deconstructions, opening up concepts and definitions. However, what makes feminist technoscience so easy to take close to one's heart is its sensitivity and ability to ask questions that are crucial for all the inhabitants in the blurry societies of today: "[…] how things work, who is in the action, what might be possible, and how worldly actors might somehow be accountable to and love each other less violently." (Haraway, 2003, pp. 6-7).

Feminist guiding figurations

In the following I will present my feminist guiding figurations or the companions that have contributed in my traveling as epistemological standpoints.

Cartography

The following words by Rosi Braidotti have inspired my work: "I think that many of the things I write are cartographies, that is to say a sort of intellectual landscape gardening that gives me horizon, a frame of reference within which I can take my bearing, move about, and set up my own theoretical tent. It is not by chance therefore, that the image of the map, or of mapmaking is so often present in my texts . . . ." (Braidotti, 1994, pp. 16-17). I would like to see the metaphors from cartography and maps as an opportunity to understand the phenomenon of information technology as a landscape which is created not by one specific information technology but a number of such technologies. When Braidotti says that for her, every text is a camping site, I say that every IT interpretation and IT practice, including my descriptions of these, is the equivalent of Braidotti's camping sites. When Braidotti describes camping sites as tracks of places she has visited, I can say that my information technology practices are not merely tracks but an integral part of the map. I want to see if different practices and interpretations can fit into one and the same map.

I work with the actual concept of information technology but do not strive to find one, universal definition. I try to find answers by using texts as local interpretations and practices in the area of information technology. I call this "the cartography of information technology." The map must be filled with a variety of stories based on different interpretations of information technology and different practices. It must also contain analyses of a variety of official texts about information technology. With the help of this IT map I aim to bring about a broadening and extension of the understanding of information technology. I also wish to investigate if the use of the cartography metaphor can create new boundaries.

Nomads

Rosi Braidotti proposes a metaphor or a figuration which she calls "nomad." She says that "the nomadic subject is a myth, that is to say a political fiction, that allows me to think through and move across established categories and levels of experience: blurring boundaries without burning bridges." (Braidotti, 1994, p. 4). A nomadic subject thinks critically. It embodies experience. It opens up new opportunities for life and thought. It thinks in a different way, discovering new pictures and models of thought to liberate us from dualisms which are created when boundaries are drawn up. A nomadic subject is also an epistemological position. (Braidotti, 1994, pp. 1-4, 8, 10). A nomadic subject is always on the move, on its way through somewhere. A nomadic subject avoids fixed categories and classifications. A nomad transgresses boundaries. For me, a nomad represents both an opportunity – boundaries are not unchangeable – and a challenge – not to be bound by boundaries but question them instead.

Boundaries

I am preoccupied with boundaries and transgressing them. A major reason for this preoccupation is that I have both identified and crossed many boundaries in my life: from Finland to Sweden, from Finnish to Swedish and English, from librarian to information gatekeeper, from librarian to guide, from librarian to postgraduate student, from questions of equality and feminism to feminist technoscience, from doing to thinking; from the angry My and the mystical character Snusmumriken in the Moomin stories[16] to a braver and more open asker of questions and a wanderer; from an outsider to an insider and someone in between. Christina Mörtberg says that "transgressing boundaries and wandering between cultures provides training in translating. Finding yourself in between categories and refusing to take the safest route shows an understanding which is very different to the dominating kind." (Mörtberg, 1997, p. 11). Crossing boundaries also creates opportunities for finding yourself between different positions and it allows one to stand outside temporarily. Training and actually transgressing boundaries is not always a painless enterprise as it can create a feeling of homelessness and rootlessness. If, at the same time, you consciously adopt an epistemological situation you will never find yourself in a vacuum. Situating also ensures that transgressing boundaries is never a coincidence but is initiated by an active subject with specific goals.

The boundaries must first, however, be identified before they can be crossed. An identified boundary in my own research material is encapsulated in the Swedish government's IT bills, in which the focus on the technical aspects of the definition of IT forms a boundary which allows inclusion but also causes exclusion. By discussing with practitioners of information technology I wish to investigate if this boundary is a feature of local practices. If the boundary exists then surely it can be transgressed? Haraway reminds us of the significance of remembering that "categories are not frozen . . . The world is more lively than that, including us, and there are always more things going on than you thought, maybe less than there should be, but more than you thought!" (Lykke & Markussen & Olesen, 2000, p. 55).

Several boundaries will be investigated. I have consciously restricted the number of subjects interviewed. It is their stories and my analyses which have spurred on my research. One of the boundaries and its crossing which is clearly apparent in the different stories and analyses is that between designer and user. What are the various definitions of the designer/user role in literature discussing system development and IT design? How do these definitions fit in with day-to-day practices, and vice versa?

Are cartography and boundary transgressing sufficient in themselves? As Donna Haraway puts it: "boundary crossing in itself is not very interesting for feminist, multicultural, antiracist technoscience projects." (Haraway, 1994, p. 16). Braidotti's nomads yearn for change and transformation. (Braidotti, 1994, p. 22).

Diffractions

The diffraction is a metaphor or figuration which interplays with cartographic work and which reinforces the partiality of the picture of the map. Donna Haraway challenges us to forget the reflection since it does not enable us to produce anything new but merely reflections (re-mirrorings). Instead, Haraway suggests, we should use the picture of a diffraction. Haraway often uses terms connected with the eye, sight and light rays. She offers the following description of a diffraction as an optical phe-

[16] written by the Finnish author Tove Jansson

nomenon: “Well, when light passes through slits, the light rays that pass through are broken up. And if you have a screen at one end to register what happens when you get is a re-cord of the passage of the light rays onto the screen. This ‘record’ shows the history of their passage through the slits. So what you get is not a reflection; it’s the record of a passage.” (Harawy, 2000, p. 103). Haraway also applies the concept of diffraction to technoscience, saying: “First it is an optical metaphor, like mirroring, but it carries more dynamism and potency. Diffraction patterns are about a heterogeneous history, not originals. Unlike mirror reflections, diffractions do not displace the same elsewhere. Diffraction is a metaphor for another kind of critical consciousness at the end of the rather painful Christian millenium, one committed to making a difference and not to re-peating the Sacred Image of the Same.” (Haraway, 2000, p. 102).

Diffractions help me to understand that there is more than one single picture of information technology. Each practice and interpretation is a diffraction and contains its own history: its place of origin, who created it and in what context it was created. Diffractions also reinforce the irrelevance of trying to understand information technology as an either/or phenomenon, something which all my empirical material had already made clear to me. Diffraction as a metaphor can release me from the modern dualistic principle of the modern world order.[17] Diffraction also creates the space necessary for appreciating that these various pictures of information technology are not necessarily synonymous. They can be both contradictory and complementary. They can even be invisible, depending on who is looking at them and interpreting them: ”it is from the same location that you can both see and fail to see.” (Braidotti, 1994, pp. 13-14).

Method of analysis

When analysing my material, I have been inspired and challenged by Actor-Network Theory (ANT) and its subsequent development, Actor-Network Theory and After (ANTa). In the following chapter ‘From Networks to Fluids and Fires – Actor-Network Theory as an Analytical Perspective’ (Part A, Chapter 2), I give an introduction to the roots of ANT and ANTa, which includes some personal reflections. As I pointed out above, creating categories, such as method of analysis in this case, is a forceful reduction, especially in discussing ANT/ANTa only as methods of analysis. The ANT/ANTa approach can work as an analytical method, but in that case the analysis must be kept closely linked to and not be cut loose from the epistemological understandings that the approach is based on: situated sociomaterial networks/relations constructed in co-operation between human and non-human actors.

Structure of the Thesis

It is necessary to say a few words about the structure of the thesis. It consists of three parts, named A, B and C. Part A is the introductory part that provides the starting points for the work done before and during the empirical part of the thesis. Part B contains the stories that are based on the empirical material from information technology practices. Each story is independent of the others and can thus be read separately. Finally, Part C collects together the threads from the various empirical stories, not by summarising them, but by extracting the themes that link the stories together. Part C also indicates practices and research to come.

In order to get an overall picture of the thesis, I recommend that the thesis should be read as a monograph. However, if the reader is interested in shorter independent stories with their specific questions and context, it is also possible to read the individual stories separately.

For the reader who is perhaps more interested in my methodological and analytical points of departure, I recommend part A ‘Prologue’ and part C ‘Epilogue’ of the thesis.

[17] See for example Latour, B. (1993)

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Chapter 2. From Networks to Fluids and Fires – Actor-Network Theory as an Analytical Perspective

Introduction

This article is about Actor-Network Theory (ANT) and Actor-Network Theory and After (ANTa). As my point of departure, I will summarise my reading of an article by Michel Callon published in 1986, namely "The sociology of an actor-network: the case of the electric vehicle". There are several reasons why it is meaningful to start with this specific text. First of all, it has been regarded as one of the seminal articles of ANT research in general. In this article, Callon works with many of the central notions and concepts that have gradually become the core of ANT, and which have been developed further and discussed by many other ANT writers. For me personally, it was this article that awoke my interest in ANT in general. In his article, Callon describes a project from the 1970s in which the goal was to develop an electric vehicle. A government agency, fuel cells, city councils, engineers, cars, money and negotiations are all discussed. All the elements participating actively in the story; hesitating, acting out given roles, and resisting. The story was (and still is) tempting and inspiring. My question was: Wasn't Callon, in fact, doing something I had dreamt about? Was he not telling a single, yet multi-layered story. Wasn't he and other ANT/ANTa researchers providing the very method of analysis for my empirical material that I had been seeking? How was ANT/ANTa responding to my concern to take care of all the different elements in information technology and bring them together into one analysis and one story?

The method of working is first of all try to understand the basic features of ANT when analysing processes where human and non-human actors co-exist and co-operate. In order to do so the vocabulary of ANT is necessary as the key for an ANT based analysis. I have read a number of articles published between 1980 and 2000. This approach gives the opportunity to look at some of the definitions, some of the developers, the time perspective and the topics and issues with which ANT researchers have been working. The implicit question when choosing texts within a time interval of twenty years and reflecting them against Bruno Latour's statement about the coffin and four nails: "I will start by saying that there are four things that do not work with actor-network theory; the word actor, the word network, the word theory and the hyphen, Four nails in the coffin." (Latour, 1999, p. 15)

This article also has its background in the criticism, initiated above all by Bruno Latour and John Law at the end of the 1990s, against the current state of Actor-Network Theory (ANT). The main issues of the criticism were directed at the use of the network metaphor and the performative character of the ANT narratives. According to John Law and Bruno Latour, the notion of network has thereby lost its power as a strong analytical metaphor (Latour, 1999, Law, 1999) John Law writes: "if people are no longer so keen to talk about systems, then the term 'network' is on everyone's lips, from Al Gore via Bill Gates to Manuel Castells." (Law, 2000). According to John Law,

the ANT stories have been infected by hegemony, functionality and managerialism. What worries Law is that the stories ANT tells are not only texts but they are performative and thereby reproduce the very phenomena they describe (Law, 1999).

The aim of this article is to see how the later development of ANT, sometimes called Actor-Network Theory and After (ANTa) (see e.g. Law & Hassard, 1999), responds to the ANT criticism and if it can offer an alternative analytical approach to traditional ANT. Are ANTa stories different from ANT stories? Can the ANTa perspective resolve the possible limits and limitations of ANT? In the concluding discussion, I will bring ANT and ANTa together and see if it would be meaningful to study the possible similarities and differences without creating an antagonistic dichotomy. Do we have to abandon the ANT perspective if we take seriously both the problematisation of ANT and the answers to this problematisation provided by the ANTa perspective? Or is there a way to intertwine these perspectives without creating a categorical dualism?

The way I have chosen to read and understand ANT and ANTa has its grounds in the epistemological and methodological discussions raised by feminist theories. Rather than merely doing gender equality studies and starting from ready-made definitions of exclusions and inclusions, I have been more interested in working with concrete practices situated locally and letting these practices define what information technology is all about. What I have been interested in working with was the question of if, and if so how, borders are drawn; for example, the border between the social and technical, and that drawn between people and artefacts. Are these borders transgressed in local practices? was also one of my research questions. The texts, topics and issues of ANT and ANTa I have read for this article, the way I have read them and my interpretations are strongly influenced by feminist epistemological discussions (See e.g. Harding, 1986, Haraway 1991, 1997). These discussions concern how scientific stories are told, and by whom and for whom they are told. The issue relates to the claims scientific research makes about the world and reality, and how the universal claims of scientific knowledge relate to partial, local and situated knowledges. It is these issues that have guided my ANT and ANTa readings.

Actors, Networks, Translations and a Project

As the starting point for the ANT metaphor collection I chose Michel Callon's classic ANT article from 1986 "The Sociology of an Actor-Network: The Case of the Electric Vehicle" (Callon, 1986). The empirical material in Callon's article is taken from the French project from the 1970s concerning the development of an electric car (VEL).

In this article, Callon introduces some of the fundamental concepts within the ANT vocabulary, namely actor, actor-network and translation.

In order to illustrate what he means by actors first, Michel Callon lists the entities present in the vehicle project, such as consumers, social movements, ministries, accumulators, fuel cells, electrocodes, electrons, catalyst, electrolytes and so on (Callon, 1986, p. 20). The actors are active in a context, in relation to each other. The entities become actors when they are related to other actors: "[the actors]…act, react and cancel each other out, in just the same way as any others." (Callon, 1986, p. 22). One could say that the actors have no pre-defined existence as actors in a specific context. The relational actor-world shapes them: "The actor-world not only determines the repertoire of the entities that it enlists and the histories in which they take part. It also determines their relative size." (Callon, 1986, p. 22). The actors are not small or large per se, but it is the empirical case that both determines and shapes their size. In addition to the definition concerning size, Callon suggests that the actors cannot be categorised on premises based on their importance per se, but "the activist in favour of public transport is just as important as lead accumulators which may be recharged several hundred times." (Callon, 1986, p. 23).

The notion of network is a metaphor Callon uses to describe how the actor-worlds function and how the relations between the different actors are organised and structured. Actor-network is Callon's own term for describing actor-worlds: "It is clear that an actor-world may be more, or less, extended, heterogeneous and complex. How shall we describe this range of possibilities, and the translations that occur between them? In order to answer this question, we introduce the notion of actor-network. This concept allows us to describe the dynamics and internal structure of actor-worlds." (Callon, 1986, p. 28).

Callon describes the term translation in the following way: "Actor-world defines [entities'] identity, the roles they should play, the nature of bonds that unite them, their respective size and the history in which they participate." (Callon, 1986, p. 24). It might be easy to depart from previous practices, processes and projects where one found actors with the same names, labels and enrolments and assume that they are doing exactly the same things with new contexts and new actions. This is exactly the opposite of what Callon says about translations. Translations are situated, specific in contexts and localised, and in this way, also unique. It is only the actual empirical case, including its contexts that can tell us something about the actors and their roles. The translations can be understood as on-going negotiations where the role of each actor is defined.

Callon separates three different aspects of translations, namely translator-spokesmen, translations as geography of obligatory passage points, and translations as displacements.

Let us start by looking more closely at the translator-spokesmen. In his article, Callon lists the various spokesmen: "EDF [Electricité de France] translates Renault, EDF translates fuel cells, EDF translates customers. EDF attributes to Renault an identity, interests, a role to play, a course of action to follow, and projects to carry on. EDF characterizes fuel cells, the way they work their performance, and their mode of use." (Callon, 1986, p. 24). He also says that "the translator is thus the spokesman of the entities he constitutes" (Callon, 1986, p. 24). As I interpret Callon, it is when the translator-spokesman starts to work that the actors needed for the actual actor-world are identified and their roles are defined. What the translator-spokesman actually does is to negotiate. A translator spokesman will ask: How to make the actors become inter-

ested in the project and make them act in a desirable way so that the different actors will consider participating in and working for the project.

What kinds of strategies are accessible and available to the translator-spokesmen, or what kinds of strategies are included in the repertoires of the translator-spokesmen? First, Michel Callon talks about the geography of obligatory passage points. In the VEL article, the very idea of the VEL can be considered as an obligatory point of passage. It becomes the core, and the meeting and melting point for various heterogeneous interests. What Renault, for example, is after in the project is not identical with the goals of the environmental movement. At the same time, the VEL project will work as an obligatory passage point for them in order to achieve their specific goals. Neither Renault nor the environmentalists can carry on with their own interests if they do not become part of the VEL. If this is the final argument of the entities, the translator-spokesman, EDF, has succeeded in its translation by using the VEL as the common platform. In this way, the VEL has functioned as an obligatory point of passage.

The processes and results of displacements will work as "links necessary to make the entities accept certain spokesmen and certain points of passage." (Callon, 1986, p. 27). Callon gives a list including some possible displacements such as inscriptions, reports, memoranda, documents, survey results, scientific papers, meetings, symposia and study sessions, materials and money; physical and social displacements (Callon, 1986, p. 27). The displacements become a sort of voice amplifier. In the same way, articles, reports and books can be used to convince the entities of the gains of the VEL project, and the spokesmen can arrange meetings and seminars where the contents of the articles and other texts can be further disseminated.

What Callon does when telling the story of the VEL is show the complexity of the project. The VEL project was not a linear process where everything was defined beforehand. When describing similar projects afterwards, it is easy to paint a picture showing a process where everything has its place and where this place seems to be given, the only possible one, obvious and evident. The reason why we are not conscious of all the various parts of the processes is understandable when we bear Callon's words in mind: "Successful translation quickly makes us forget its history." (Callon, 1986, p. 28). Describing the VEL history as Callon does, the multitude of perspectives becomes intertwined. Callon does not separate the social, the economic and the technical aspects. Instead, he wants to strengthen the idea that it is not possible to understand phenomena as either social, technical or economic, but that all these aspects are so integrated and involved that the social would not be possible without the technical and vice versa.

Michel Callon gives a chronological account, though not in a linear sense. In this way his story also becomes a story about a process. During this process, different actors enter the stage gradually and, depending on what happens, subsequent actions are the effect of previous ones. This does not need to mean that the initiator contacts actor after actor and waits for results of the negotiations, but that there are several parallel negotiations going on. What the initiator and the project sought is stabilisation, so that the electric vehicle could become a real vehicle and a part of the French car production, and thereby also a part of the everyday transport system and not a mere vision, dream or plan.

Alongside the empirical story, Michel Callon also works on a meta-story level. To be able to describe, analyse and understand the project, he uses a vocabulary consisting of metaphors and terms, which make the story tellable. I see the metalevel as an analytical level shaping and reshaping the story by focusing on relations between the different actors. The metalevel also tells how the actors become actors in the first place, what it takes to be counted as an actor and how different actors are connected to each other in different kinds of actions. The analytical level can also be cut off from its original story and be moved to another context when telling other stories.

What is Actor-Network Theory?

What makes it difficult and complicated even to try to write about ANT and ANTa in general terms is that ANT is not one single thing, a unified and coherent theory. This means that both finding a structure and a content for a text aiming to give an introduction to, or an idea of, what ANT and ANTa migh be becomes a delicate assignment. Should one be true to ANT from the 1980s, or should one start from the new landscapes towards which ANT is moving?

One way to speak about ANT and ANTa is to do it through texts published at different periods. This choice can give the reader some hints of what kinds of research questions ANT and ANTa have been occupied with. This way of talking can also enable one to follow the ways ANT has changed during the 20 years of its existence. The approach I have chosen also emphasis the idea that ANT is not a coherent theory but is rather an analytical method best exercised by being performed than summarized (Law, 1997, p. 2).

The Year 1980: Translations

Let's move to the very beginning of ANT. In 1980 Michel Callon published an article which can be regarded as the first ANT article ever to be published.[1] Already the main title and its subtitle give the reader a hint of what is at the heart of the article, namely the word "problematic" and the notion of the "socio-logic of translation" (Callon, 1980). Callon introduces the notions of problematisation and translation when he studies how the decisions concerning research problems and research programs are made in a research laboratory. The other central aspect of the article is the relations between the scientific and the social, which Callon localises not only in research laboratories but also in discussions of the social studies of science.

In order to talk about how the decisions of the main research issues are made Callon has to tell a very detailed story about the different persons and stages involved in the

[1] Actor-Network Resource: An Annotated Bibliography, Version 2.3, http://www.comp.lancs.ac.uk/sociology/css/antres/antres.htm [2003-04-22]

decision processes. He follows three scientists, called X, Y and Z. The reason why Callon tells us such a detailed story is that he wants to show that doing science is not a question of scientists sitting alone in research laboratories, where scientific work consists of sudden discoveries and innovations. By not choosing one single main character as the main player in the story Callon argues the scientific work is about negotiations, everyday non-heroic compromises and a construction of many bits and pieces. Callon and the readers must follow the steps of the process in order to understand the message of the story. Unfortunately, this means that now and then the story becomes hard to follow. One reason for this difficulty is that Callon has chosen to dub the scientists with the letters X, Y and Z instead of using personal names. The choice makes the story rather abstract and disconnected from concrete local practices; but the story also functions on another level. Science is not connected to specific scientists, but to the practices of scientific knowledge production.

The article starts where many ANT researchers also can be localised, namely in the world of science. It is about France, the 1950s, the DGRST [General Delegation to Scientific and Technical Research] (Callon 1980, p. 218), fuel cells, documents and researchers. Callon says that the DGRST aimed at "preparing, coordinating and implementing French policy with regard to scientific and technical research." (Callon, 1980, p. 199). One of the research fields the DGRST operated within was the development of new energy sources. With the archived documents as his guide, Callon could follow developmental and research processes. To start with, two scientists, whom Callon calls X and Z, were given an assignment in order to frame the research problems concerning new energy sources. X and Z ended up with totally different research proposals. The DGRST decided to follow the path outlined by scholar X. In Callon's words: "The committee accepted X's proposed problematisation" (Callon, 1980, p. 203). After that, another scientist called Y started to work out a research programme based on X's problematisation. The DGRST approved the research programme of the scientist Y. Finally, two researchers called A and B were employed by scientist Y after his research proposal had passed through the DGRST committee.

One of the central concepts in Callon's article is 'problematisation'. In using this concept, Callon is referring to the work done by the two scientists, X and Z. What X does is that he works out an extremely well-structured table where he shows what is interesting to research on, he 'demarcates and defines spheres of research' (Callon, 1980, p. 200). With the help of this table, X classifies phenomena and places them in different categories: phenomena which do not need to be researched, where the definitions and concepts are clear, well-formulated and taken for granted; and phenomena where more research and investigation needs to be done. We have the first problematisation. The scientist Z does exactly the same thing, but ends up with totally different conclusions when formulating the problematisation, which is identical to defining new research questions. This is the second problematisation in a series of many. (Callon, 1980, pp. 200-203). But, as said above, it is the problematisation of the scientist X that is passed by the research committee. After this stage the third problematisation comes into play. It is formulated in a new table, compiled by scientist Y, the one who formulated the research programme using the problematisation of X as the point of

departure. A and B, the scientists working at the research laboratory, also formulated their own problematisations.

Callon says that although the several problematisations seem both to "complete each other, expose each other, join together, separate they all share an identical structure" (Callon, 1980, p. 207). First of all, they all state what is relevant for research, and what is not. They also frame the domains to which science belongs, and the domains that lay outside science. The common feature for all these problematisations is that they elaborate on the appreciation of being inside and outside and show that the categorisations are both adequate and necessary.

Secondly, they all define, although ending up with different conclusions, what can actually be taken for granted, and what cannot. The latter becomes the domain to be researched. There is no clear border between the things we know and those that are unknown in the sense that the unknown would stand in an opposite position to that occupied by what is taken for granted. There is no disorder without order. In spite of how the choices of problematisations are made, Callon writes as follows: "This remark leads me to emphasise the general nature of the problematisation process. It indiscriminately affects areas which are normally considered to be scientific, technical and economic, and it actively participates in setting up these categories." (Callon, 1980, p. 208). And he continues: "… every problematisation works out on its own account what is internal and what is external, what is scientific and what is technical, the links which should exist between the two, etc…" (Callon, 1980, p. 209).

Callon says that every problematisation consists of three fields: the unanalysed, the field of certainties and the field of suspicion. It is the field of certainties which encompasses the taken-for-granted; the unanalysed field is the field which is left untouched. The field of uncertainties is where the researchable problems are situated (Callon, 1980, p. 209). Every problem is then connected to an actor and a place of action. Just to give an example of what this means, let's have a look at the research structure worked out by the scientist Y. First he defined a series of research problems (which, as mentioned before, were based on the preliminary problematisation by the scientist X). After that he identified the actors, in this case research centres, laboratories etc., which could work with the problems already formulated. It is here that Callon introduces the notion of translation: "[Y's list of problems] translates a determination to incorporate interests, and to interest those who are still only potential partners. In fact, Y's programme represents an attempt to mobilise social groups. I propose to call this particular logic by which problems are directly associated with groups "the socio-logic of translation." (Callon, 1980, p. 210). In order to better understand the meaning of the notion of translation, it might be wise to take one step backwards and look once more at the work done by the scientist Y. By linking the scientific problems to different research communities, Y actually says that there is a social connection between the two. He does not only make a statement of these linkages. If I express this in a very simple way, when connecting a given research problem to a particular research community, Y actually "constructs the system of social interactions." (Callon, 1980, p. 211). This is what Callon means by socio-logical (Callon, 1980, p. 211). Transla-

tions are thus about relationships. First of all, even if problems may be defined in different 'territories' (Callon, 1980, p. 211) they still have meanings that are related to each other between the territories. This might, for example, mean that even if the new energy sources do not have the same meaning for energy companies as for environmental movements, there are enough similarities. The question of fuel cells, for example, is important for both, even if it might mean a detour on the way to achieve their goals, which at first sight seem quite contradictory. Secondly, in order to solve the defined problems displacements might be necessary. This might mean that not only one institute can solve the problem of the fuel cells but that several institutes and institutions are needed in order to find solutions to the problems.

But things do not always work out so smoothly. Perhaps the potential research institutions thought out by the scientist Y do not accept the problem assigned to them, or perhaps they argue against the original problematisation as a whole. Callon lists five different possible responses to Y's research programme: tagging along, negotiations 1 and 2, opposition and inertia (Callon, 1980, p. 213). It is only tagging along which describes a successful translation (Callon, 1980, p. 214).

What Callon really wants to do is to call into question the categories of social, technical and cognitive. By telling us the story about the French fuel cells and the planned research programme, and by introducing the notion of translation, Callon asks us to think about how the technical is the technical, how the social is the social and how the cognitive is the cognitive. The real challenge that he offers us is to re-consider the illusion of the 'chopped-up, compartmentalised world'. He says that "the dividing line what is considered social and what is considered technical is constantly renegotiated" (Callon, 1980, p. 198).

What kind of comments would I like to make about Callon's text? Being one of the key texts of early ANT, it is clearly essential reading. The expression "has to be read" suggests that we have a text that might be classified as obligatory; and in a way, this is exactly what I want to argue. It is an obligatory text if one wants to work with ANT approach because Michel Callon launches an extremely vital epistemological and theoretical challenge to the way in which we interpret the world, and to the great modern divisions of science, technology and society. By using an empirical case he shows that simply by following the stages of different practices at the DGRST it becomes clear that both science, technology and society are constructed and that this construction is an ongoing, continuous process. He also shows very powerfully, again using the same empirical case, that the constructing processes of science, technology and society are not separate entities but are incorporated and intertwined. This has been the core topic for the growing field of ANT since 1980. Many of the ANT writers – Bruno Latour being one of the important figures – have worked with the same epistemological principles, at the same time emphasizing that it is the empirical material that should speak. "Follow the scientist" is one of the already classic mottos of Bruno Latour. In Callon's text, I find traces and hints of what ANT has subsequently been occupied with. Here I refer to the kind of empirical material ANT writers have used, or more exactly, from where they have taken their empirical material. First of all, we can see that a laboratory is a place which ANT researchers frequently visit. As examples, we can take Bruno Latour's works "Science in Action" (1987) and "The Pasteurization of France" (1988), as well as the book he wrote together with Steve Woolgar, namely "Laboratory Life" (1979). If we look more closely at the scene in Callon's article, we find that his empirical case dates from the late 1950s. It has quite often been the case that ANT's empirical frames are specific historical phenomena. Of the previous mentioned ANT texts, the story about the pasteurization of France is a highly illustrative example.

When the article was published, Callon was working at 'Ecole des Mines de Paris, Centre de Sociologie de l'innovation'. He was a sociologist doing research on practices of science. Let's keep this in mind when we look at the concluding words of Callon at the end of his article: "The sociologist is caught up in the same situation as the scientist. He cannot avoid answering the question: where do the frontiers lie between what is certain and what is uncertain, between fusion and fission? In talking of content, the sociologists start out from an already existing problematisation. How with the aid of these conditions can he differentiate his enterprise from that of the scientist?". What should the sociologists do? "The sociologist adds one more translation to those produced by the protagonists. … he is like all other actors. He cannot differentiate his enterprise in principle from that of the scientist. He differs only in that his practical focus if interest is that of translation…" (Callon, 1980, p. 217). It is not easy to understand or to put into exact words what Callon means. I understand his words as follows. The worlds of science and sociology are not separate in some epistemological way. What might separate the scientist and a social scientist is the articulated epistemological standpoint. Leaving all nuances behind, we can argue that what the scientist with a positivistic epistemological standpoint is not aware of, or even denies, is that science in itself is both a construction and a constructor of reality. The unconscious position means that the scientist keeps the scientific and the social strictly apart and claims that science is only interested in working with the natural. What the social scientist might do is to add a social layer to the work of the scientist by talking about social constructions of the scientific. The social scientist has the mandatory and the explanatory power to lay a social screen on the work of the scientist. Social scientists keep the scientific and the social apart in exactly the same way as the scientist. What Callon offers is the radical claim that the social is constructed together with the scientific, and that the social scientist has no absolute or hidden knowledge that would not exist among scientists. The translations, the transformations are already made in practices, in relations between different actors. It is not the sociologists that construct the relations: they already exist there in activities and practices. The social order is also shaped and constructed in these relations; it is not a pre-existing structure. What is really crucial in ANT thinking is that the social as well as the scientific are constructed by scientists as they act. This has radical consequences for how to carry out sociological studies of science and technology. Many social scientists start from a pre-existing social order, which is understood both as a driving force and/or an analytical concept in the context of social studies of science and technology. Once more, with regard to Callon, the social and scientific are constructed and negotiated hand in hand with each other on a continuous basis and are not created by the social studies of science and technology.

What Callon is doing in the article is that he is working with two parallel projects, so intimately interrelated to each other that they in fact turn out to be one and the same project. He is building up ANT and at the same time he is fighting against the ways in which, for example, the research field called the sociology of scientific knowledge talks about the social construction of scientific knowledge. He is creating an ANT vocabulary. This is necessary as without the new and 'innocent'[2] terms and notions, Callon and ANT in general could not talk about the social and the technical, and the humans and the non-humans all in the same breath. Callon's article is both a starting point for ANT and a criticism of the social constructivist studies of science and technology. This proves to be one of the red threads in many of the later ANT articles.

The Year 1986: Actor-Networks as Simplifications

In this section I focus on his notions of actor-network and simplification. The notion of network is a metaphor Callon uses to describe how the actor-worlds function and how the relations between the different actors are organised and structured. The notion of simplification is directly connected to the actors of the networks and how the relations inside the networks are made possible in the first place.

Actor-network is Callon's own term for describing actor-worlds: "It is clear that an actor-world may be more, or less, extended, heterogeneous and complex. How shall we describe this range of possibilities, and the translations that occur between them? In order to answer this question, we introduce the notion of actor-network. This concept allows us to describe the dynamics and internal structure of actor-worlds." (Callon, 1986, p. 28).

If the notion of actor-network is needed to be able to say something about the internal structures of actor-worlds, we also need to use the concept of simplification. By simplification Callon means that in the actor-world the entities and their attributes are clearly defined. This in turn means that when the entities turn out to be actors in actor-worlds, only a limited number of all their possible qualities and possibilities are mobilised. As Callon expresses it, it is a question of reduction. To make this thought clearer he gives us some examples of simplifications: "[a]…town consists of more than public transport, the wish to preserve town centres and the town councils that constitute their spokesmen. However, so far as the EDF is concerned, they may be reduced to a transport system that must avoid adding to the level of pollution and a town council that seeks to advance this goal. EDF does not need to know more." (Callon, 1986, pp.28-29) Callon also adds, as in the case of translations, that 'simplification is never guaranteed. It must always be tested (Callon, 1986, p. 30). Entities in actor-worlds are entities only in relation, or as Callon puts it, in juxtaposition to other entities (Callon, 1986, p. 30). The actor-network needs simplified actors in order to create an internal and stable structure. At the same time, there is no guarantee that the simplifications really work in the ways that are necessary and essential for the actor-network. If the fuel cells or the inhabitants of the municipality start to offer resistance, demonstrate or go on strike, it is a reminder that the actors are actors also

[2] innocent compared to existing sociological concepts

in other networks where the other actors may demand something else of the fuel cells, or the city council. Perhaps the inhabitants think that there are other more important projects where public funding can be invested than in than an electric vehicle. Should one actor plan to leave the actual network it would result in the network as a whole breaking down. Networks are about relations, and relations are about actors. If one link fails, all relations and thereby the entire network, will fail. The VEL is only one possible network of many potential networks. Something can still be done if there is the danger of a simplification failing. For example, in the case of the VEL, the city council actor can try to stop all eventual demonstrations by trying to keep the inhabitants calm. Beyond simplification, the actor-network also demands juxtapositions of the actors. "The simplifications are only possible if elements are juxtaposed in a network of relations; but the juxtaposition of elements conversely requires that they are simplified." (Callon, 1986, p. 30). Once more, it is the relations between the actors that forms the structure of a network. Again, there are no relations without simplifications. Behind these simplifications there are other simplifications and juxtapositions, or as Callon formulates it: "a net-work is durable not only because of the durability of the bonds between the points … but also because each of its points constitutes a durable and simplified network." (Callon, 1986, p. 32). Finally, the "actor-world is a network of simplified entities which in turn are other networks." (Callon, 1986, p. 32). A network is like a Chinese box or a Russian doll.

In this article, Callon is building up and developing the vocabulary of ANT. The terms which are of central importance in the VEL article are the basic ones of ANT, namely actor, actor-world and network. Callon is moving between the concrete case of the electric vehicle and the more general ANT concepts. Both he and ANT need new words to be able to talk about our world and avoid the fundamental structures and concepts that social studies are based on. It wants to develop new concepts, or preferably new metaphors, that would allow the social scientists to liberate their analysis from the great divisions of the social and the natural. The great project of trying to talk about the world of humans and non-humans in one sentence and on an equal level demands a language of its own.

The year 1987: Long-Distance Control

One year later Callon published his article about the central concepts of ANT, John Law wrote an article about long-distance control (Law, 1987). In this article, Law talks about Portuguese ships in the 16th century, and tries to explain why Portuguese ships were so successful in travelling to India and returning to Portugal. He takes as his starting point the central idea of ANT. He uses the Portuguese ships to illustrate the notion of network, and more particularly, the idea of the heterogeneity of networks. The story does not, however, end with the description of a network. Law wishes to explain how it is possible for some networks to be stable. This question is very important if we think about how vulnerable and fragile the relations between the different actors in networks can be. Machines may break down, and people may become ill.

It is quite amazing how an historical article containing detailed descriptions of vessels, sails and navigational tools can be such fascinating reading. The main contributory

factor to the reading experience is perhaps not the details themselves, the names of the vessels and the people and dates, but the rich texture of the heterogeneous materials woven into the descriptions. The story tells a much wider story about how the Portuguese navy was able to become so successful in the 16th century, more so than histories produced by separate sectors e.g., economic or naval history. The main question Law asks is: "how to manage long distance control in *all its aspects*." (Law, 1987, p. 235. Italics as in the original text). What he is referring to in this statement is "that it is not possible to understand this expansion [the Portuguese vessels and thereby the imperial state of Portugal] unless the technological, the economic, the political, social and natural are all seen as being interrelated." (Law, 1987, p. 235).

How does Law express the interrelations in his story? The story starts from the vessels. Law lists four winning attributes. First of all, he talks about military qualifications: "…they were virtually impregnable to attack by boarding from small craft."[3] (Law, 1987, p. 238). After that, he talks about how the vessels had outstanding cargo capacities. This in turn meant that the vessel did not have to make so many stops during the journey for loading supplies. This in turn contributed to the relative independence of the ship. Law then moves on to talk about the sails that became smaller and thereby also more capable of resisting storms and strong winds. The relatively small size of the sails also made it possible to manage the vessel with a relatively small number of seamen (Law, 1987, pp. 238-239).

Thus far Law has described artefacts and people. But what about elements of control? Here Law talks about compliance; putting people into line. As an example of control and power over people Law discusses the power of the Portuguese weapon used against the enemies on the journey from Portugal to India, and how superior Portugese military methods were as compared with the weapon systems used by other nations and other constellations. It was not only the enemy that had to be forced into compliance with Portuguese power. Their own Portuguese people, seamen, had to be part of the system that guaranteed long-distance control; that the ships found their way to India, loaded up with spices and returned home with their cargo. The seamen had to be loyal and capable of navigating and defending their vessels. Following the ANT thoughts of heterogeneous actors, Law also reminds the reader that even the vessel had to be put into line. This means that the vessel had to be able to sail under difficult weather and navigational conditions. Showing all the characteristics of how the Portuguese naval system developed both ships with good navigational qualities and how winds and waves, guns and seamen were co-ordinated, Law is ready to move on to a more general discussion of long-distance control. He says that "mobility, durability, capacity to exert force and ability to return" are the conditions of any long-distance control system (Law, 1987, pp. 240-241).

Law does not stop at his general statement about long-distance control but investigates further the relationships between heterogeneous elements consisting both of humans and non-humans. One of his examples concerns the development of the navigational system. From being dependent in the Mediterranean case on the geographical closeness to coastlines, the Portuguese developed simple and easily movable navigational instruments, documentation and easy dissemination of necessary navigational and astronomical data, as well as a set of rules about how to use both instruments and documents (Law, 1987, pp. 245-249). After describing what elements played a part in the success of the naval story, Law finally asks what types of elements he is talking about in the context of long-distance control. He draws the conclusion that there are three types, namely documents, devices and drilled people (Law, 1987, pp. 251-254). All three elements are mobile and durable, and constitute the crucial conditions for long-distance control.

Here we can return to the beginning of Law's article and try to recall what his intentions were in writing the article. Let me quote him: "…the first purpose of the present paper [is] to make a contribution to a general analysis of long-distance social control. There is a small body of recent work in which an attempt has been made to develop a systematic vocabulary that would make this possible[4] and this paper is therefore intended as a contribution to that literature. It is also, however, intended as a contribution towards the sociological treatment of technology." (Law, 1987, pp. 235-236). How should one understand the notion of long-distance social control outside the story of the Portuguese vessels? My first association was to connect the phrase 'long-distance' to geographical distance. However, when I looked at the articles Law is referring to when talking about long-distance control, I felt that what he is actually talking about is how different phenomena can be moved away from their place of birth. How they are distributed to other places and still keep the characteristics identical to the original ones or vice-versa (it is not every longdistance control that becomes as successful as the Portuguese vessels). The stories of the scallops and the electric vehicle, both by Michel Callon, illustrate that not all translations are successful, which means that long-distance control does not always work. Some of the elements – devices, documents or drilled people – might not be sufficiently durable and mobile. When Law talks about his own contribution towards the sociological treatment of technology, he links his own article to Callon's article discussed above. At first sight, one might wonder what on earth French fuel cells and Portuguese ships have to do with each other, and what their mutual connection is to sociology. The connection is heterogeneous materialities (artefacts, scientific facts, problematisations, documents, seamen, scientists, organisations, and the state of Portugal), and the relations between the materialities that is the common core in the articles of vessels and scallops. That they should also be the core for the sociological studies of science and technology is the ANT message.

The year 1992: Networks

In 1992 John Law was working with the notion of network (Law, 1992). This time he took a concrete starting point in the form of the political situation in Europe. From the concrete situation he could talk about how networks become stabilised, and how they become ordered. The focus is on the idea that there are no clean and pure social networks of human beings. Law stresses the importance of learning to think about

[3] Here Law refers for example to Michel Callon's famous article about scallops, from 1985 and Michel Callon's article about the French electric vehicle from 1986, and Callon's and Bruno Latour's article about unscrewing the big Leviathan from 1981.

the social as highly material and heterogeneous. John Law writes about the relations between humans and non-humans in a very radical way, claiming that people are not necessarily special when compared to non-humans. He refers to the ANT argument that all actors, humans as well as non-humans, are network effects. ANT writers have been cautious about delivering summarised texts about ANT. They have concentrated on writing about how ANT can be understood through the use of analytical concepts in case studies. This article actually gives several more general formulations of ANT, however.

John Law's article is a very good place to start in order to find well-formulated and clear descriptions, particularly of a network. Such descriptions are not of networks in general, but of social networks such as societies, organisations and institutions. What John Law wants to argue is that the phenomena which we traditionally regard as social structures, shaped by humans, are, in fact, as heterogeneous and material as any other networks. By stating this he can also talk more about how networks become stabilised, and what kinds of effects the networks have. It is not important to look at networks as such to work from the question 'what', but instead to start network studying by using the question 'how' instead. How are networks ordered in the first place? How is it that some networks seem to be stable? How is it that some actors seem to have power over other actors? How do some networks seem to be large in size? How is it that some networks do not look like networks at all? In an ANT manner, Law collects all these theoretical questions from the scene of world politics by referring to the revolutionary events in the former Eastern Europe. He says that "the masters of the universe may also have feet of clay." (Law, 1992, p. 379). He asks how on earth it was possible that the political situation in Eastern Europe could last so long. How could the monsters with clay feet have power over so many people and phenomena? By asking these questions we come closer to a definition of ANT in general. John Law says that these kinds of questions concerning "the mechanisms of power" are the very questions that "lie at the heart of "actor-network theory" (Law, 1992, p. 379).

How does he argue for the statement that social networks are, in fact, heterogeneous and material? He takes us on a detour by looking first at how ANT has studied science. First, science is in itself material. Science is not only 'done' by scientists, but at least as much by test tubes, microscopes, and computers, to mention but a few of the materialities. But it is not enough simply to have all the bits and pieces. They have to be organised and ordered. Here John Law quickly states: "But I have already suggested that science is not very special. Thus what is true for science is also said to be true for other institutions." (Law, 1992, p. 381). If a society is an ordered heterogeneous network, this also means that it is not constituted only by humans and their actions. Here we have arrived at the second description of ANT; "the task of sociology[4] is to characterize these networks in their heterogeneity, and explore how it is that they come to be patterned to generate effects like organisation, inequality, and power." (Law, 1992, p. 381).

[4] I remind that the synonymy for ANT is 'sociology of translation', see e.g. Law, 1992, p. 280

Does John Law mean that there is nothing special about humans as compared with non-humans? This is what he answers: "[Actor-network theory] denies that people are *necessarily* special." (Law, 1992, p. 383. Italics as in the original text). He also states very strongly that this is an analytical, and as I understand it, not an ontological point. If there is a dividing line between humans and non-humans it exists because the line "is subject to negotiation and change." (Law, 1992, p. 383). In a network language this is the same as saying that "…what counts as a person is *an effect generated by a network of heterogeneous, interacting, materials.*" (Law, 1992, p. 383. Italics as in the original text). In giving some examples, he says that when a lecturer gives a lecture there are a large number of materialities participating e.g., an overhead projector (Law, 1992, p. 382). Here we come to the notion of agency. "Is an agent an agent primarily because he or she inhabits a body that carries knowledges, skills, values, and all the rest? Or is an agent an agent because he or she inhabits a set of elements (including, of course, a body) that stretches out into the network of materials, somatic and otherwise, that surrounds each body?" (Law, 1992, p. 384). The agent, or the actor in ANT terms, is a relational effect of heterogeneous networks. Because all actors are effects of heterogeneous network relations, one can ask if a non-human actor also can be an agent. By using the notion of agent I refer to an actor who initiates, has and takes responsibilities, and mobilises other actors. John Law does not, as I understand it, give a clear and unambiguous answer to this. At the same time, the answer depends on our interpretation of what he says in the following: "…the same is true for organizations and institutions: these are more or less precariously patterned roles played by people, machines, texts, buildings, all of which may offer resistance." (Law, 1992, p. 384). Does he mean that a machine can be an agent because it in turn is also a heterogeneous network, a relationship between humans and non-humans?

If he really means that an agent and an actor can be understood to be one and the same thing, it would mean that all actors are agents, humans and non-humans alike. The next question John Law asks in his article is why networks do not always seem to be networks, why they seem to be, and act like, one single actor. Here he takes the Bank of Credit and Commerce International, a television and a human body as illustrative examples. There are, according to Law, two explanations for this. First, all networks are simplifications. Secondly, some actors in wide networks act, or we regard them as if they were, a sort of punctualisation. Punctualisations are, in fact, effects of precarious simplifications. Law talks about "agents, devices, texts, relatively standardized sets of organizational relations, social technologies, boundary protocols, organizational forms – any or all of these." (Law, 1992, p. 385). He makes two remarks. First, like actors in the networks, one cannot take for granted that punctualisations will work as predicted. Secondly, punctualisations reduce network complexity, just like simplifications. The notion of punctualisation is ANT's answer to the way traditional sociological analysis makes a distinction between micro- and macrosocial. Law can still keep to the idea about effects but at the same time have a concept that can be used in analysing wide networks. My question then is: 'when do we need to use this notion of punctualization?' Is it useful when analysing networks and network effects in order to avoid becoming stuck with endless network openings?

The article is also about the central concept of ANT, namely about translation. First of all, Law gives a definition of the concept itself, which is a continuum of the way in which Callon introduced the term, namely: "The object [the study object] is to explore and describe local processes of patterning, social orchestration, ordering and resistance. In short, it is to explore the process that is often called *translation*, which generates ordering effects such as devices, agents, institutions, or organisations. So "translation" is a verb, which implies transformation and the possibility of equivalence, the possibility that one thing (for example, an actor) may stand for another (for instance a network)." (Law, 1992, p. 386. Italics and quotation marks as in the original text). One can understand how central the notion of translation is for John Law when we read further: "This, then, is the core of the actor-networks approach: a concern with how actors and organisations mobilize, juxtapose, and hold together the bits and pieces out of which they are composed; how they are sometimes able to prevent those bits and pieces from following their own inclinations and making off; and how they manage, as a result, to conceal for a time the process of translation itself and so turn a network form a heterogeneous sets of bits and pieces each with its own inclinations, into something that passed as a punctualized actor." (Law, 1992, p. 386).

Finally, Law asks: "how is it that we never saw before that the Gorbachevs of this world really had feet of clay all along?" (Law, 1992, p. 387). Using the more analytical ANT terminology, why are some translations successful? Law is looking for some general characteristics for successful translations and identifies four success factors: durability, mobility, centres of translations and a combination of some general strategies (Law, 1992, pp. 387-389). Concerning durability, Law says that some materials are more durable than others; paper, for example, is more durable than speech. If one wishes to produce network orderings that are stable, one should invest in durable materials. Mobility is about space, and here Law returns to the thoughts about immutable mobiles and longdistance control. The notion of translation centres comes from Bruno Latour and refers to calculations which "increase network robustness". In talking about combinations, Law just wants to remind us that it is often a combination of durability, mobility and calculations that together can work for a successful translation (Law, 1992, pp. 387-389).

As a final remark, let me quote John Law once more: "The actor-network is thus a theory of agency, a theory of knowledge, *and* a theory of machines. And, more importantly, it says that we should be exploring social effects, whatever their material form, if we want to answer the "how" questions about structure, power, and organisation." (Law, 1992, p. 389. Italics and quotation marks as in the original text).

The year 1997: Moving towards ANTA

In 1997, John Law talked about "traductions and trahisons" (Law, 1997). His article can help us in our search for some more general answers to the question: "What is ANT actually all about?" Even if John Law is not explicitly interested in clarifying ANT, he does just this in this article as he reads four ANT stories. What he tells us is that ANT is not one single thing, and that ANT has changed during its almost twenty-year existence. He also expresses uneasiness about what ANT has become, and he shows some new directions in which he is moving together with ANT.

John Law refuses to write a history of ANT. He says that: "one might represent actor network theory by **performing** it rather than **summarising** it." (Law, 1997. Bold as in the original text.). The way John Law chooses to perform ANT is to relate four different ANT stories, written by four authors, namely Madeleine Akrich, Charis Cussins, Vicky Singleton and Annemarie Mol.

Let's start with Madeleine Akrich's story from 1993: "The Description of Technical Objects" (Law, 1997). Keep in mind that it is a question of secondary reading. I use the story of John Law who tells a story about Madeleine Akrich's story. First, I will give a very short summary of the content of Akrich's article. It is a story about a Swedish machine for compacting forest waste, and how this machine travelled to Nicaraqua. It is also a story about the negotiations connected with the journey. The negotiations concern raw materials, cotton pests, a cotton-cutting machine from the Sudan, cotton roots, storage warehouses, Amphiserus Cornutu, and finally, the customers, the buyers themselves.

According to John Law, Madeleine Akrich's story is an actor-network story. Let's investigate what the seven factors are that make it an ANT story. The story is organised in terms of a structuralist notion of network: "both links and nodes have to be uncovered by the analysts. They could be otherwise." (Law, 1997). The next notion relates to the heterogeneity of the network. There are cotton, farmers and pests; "all the elements have similar status." (Law, 1997). The actors in this story are both humans and non-humans, and "…all [are] equally able to act upon one another." (Law, 1997). The next ANT feature which Law takes up is the scripts, "which means that one may read a script from, for instance, a machine which tells or prescribes the roles that it, the machine, expects other elements in the network to play." (Law, 1997). Then there is the question of the stability of the network, and here Law notes the precarious character of the enrolments: "…links and nodes in the network do not last all by themselves but instead need constant maintenance work, the support of other links and nodes." (Law, 1997). The final remark about the ANT features concerns the translation: "translation implies both similarity and difference." (Law, 1997). I wanted to show this list of the ANT components because I think that here John Law gives a very useful summary of what ANT is all about. Many of these elements we recognize from other ANT articles and discussions, but for the first time all the central elements are gathered together in one single place.

These are not John Law's final words about ANT. It seems that 1997 was the year when Law started to reconsider ANT, and how ANT had changed during the last twenty years. He asked if "actor-network theory in Paris in the 1980s [is] 'the same' as the actor network theories performed in Paris, San Diego, Maastricht, Lancaster, Keele, Melbourne, or Trondheim, in the 1990s?" (Law, 1997). John Law's answer to this question is both 'yes' and 'no'. There are similarities, but also differences. He is not ready to go as far as to say that there is no such thing as actor-network theory. He says that it would be possible to tell a unified story about ANT, just as it would be to tell a story about 'diaspora' (Law, 1997). Law maintains that ANT is not a single and unified theory but is related to other theories, fields of research, and methodologies.

A.2 John Law does not explicitly name any theories or fields of research in the article. In other places and some years later he openly mentions, for example, feminist STS studies when talking about interaction and connections between ANT and other fields of studies of science and technology (Law, 2000). Finally, when referring to questions about practices versus principles, in the sense that we should talk about performing ANT rather than becoming stuck with some principles concerning what real ANT is and is not, he says that he is actually more interested in "[exploring] differences than similarities." (Law, 1997). He uses the forest waste machine example of Madeleine Akrich as an analogy for ANT as a whole and says that what happened to the Swedish forest machine is what has also happened to ANT. Instead of focusing on the purity of ANT, Law prefers to focus on diversities and complexities. By this I understand that instead of talking about what ANT is or is not, we should instead talk about ANT in the plural. We should not demand any loyalty or form of religious affiliation to ANT as such.

Let's have a look at the work by Vicky Singleton on a programme which is part of the English national health care system. All women between the ages of 20 and 64 are supposed to take part in a screening project designed to detect cancer of the cervix. Law says that it would be possible to compose a classic ANT story about the history of the screening programme itself. It is also possible to write another kind of ANT story, focusing on the screening and the motives behind it instead. This is the kind of ANT story Vicky Singleton has written.

The screening programme is full of ambivalences. On the one hand, women are told that the method is a very efficient way of preventing cancer of the cervix; on the other hand, statistics show that during the years the screening programme has been running, mortality rates for cancer have not declined. The story of Vicky Singleton goes on, swinging from one particular point of certainty to another 'on the other hand' one. The classic ANT theorist would consider this a very unstable and fragile network in which things are not properly drawn together. Vicky Singleton says it is exactly this ambiguity that makes the network stable. Being simultaneously authoritative and non-authoritative strengthens the screening programme. Put in ANT language: "the network precisely depends on the **mobility** of all participants, of their ability to shift between different roles, different relations, between roles or links that do not fit, that are inconsistent with another, that do not add up." (Law, 1997. Bold as in the original text.). Law also talks about heterogeneity, but now he is referring to things that are unassimilable, "that cannot be told or performed within a single network, from a single place, or to a single point." (Law, 1997). Things are not drawn together anymore, to a single point, which was the core principle of the earlier ANT studies.

ANT cannot tell one single story, one great narrative. Instead, it should tell many small stories. It is no longer a question of telling chronological stories. The small stories are connected but do now switch to show oscillating and embracing ambiguities (Law, 1997). The direction is from reduction to ambivalences and varieties.

The year 2000: Radical Relationality

When we come to the year 2000, John Law is becoming more and more concerned about the current state of ANT. He asks self-critically what he has been reproducing when conducting ANT studies. After examining and evaluating ANT one would expect that Law is ready to leave ANT behind. In a way this is true, because he does not demand any loyalty. At the same time, he says that ANT is strong when it comes to stressing the idea of heterogeneous materiality. What ANT needs are new metaphors in order to continue working with the radical view of abandoning the boundaries of the modern world. Law asks if the cyborg metaphor of Donna Haraway could be a new guide.

What does John Law then say about ANT in this paper? First of all he states that "ANT is a semiotics" (Law, 2000). John Law suggests a link with the language philosopher de Saussure's ideas of how words receive their meanings when contrasted with other words. We can, for example, understand the meaning of the word 'mother' when we relate it to the word 'father'. What ANT says is that this linguistic relationality concerns all kinds of entities, not only words: "All entities…achieve their significance by being in relation to other entities." (Law, 2000). This has a very fundamental effect on how entities are shaped, and what they are actually about. The entities have no fixed meanings, but their meanings are created only in relation to other entities. What is the task of ANT in this context? First of all, ANT has a very radical, non-structuralist perspective on the world. It does not analyse the world and what is going on there from pre-existing social categories, such as, for example, class and gender. If there are such things as class, gender or various structures in the world, they are effects of network relations. The world cannot be explained and understood with the help of universal categories and classifications. The only means of analysis is always to start from the question 'how'. If something seems to have power, the explanation cannot be found in social science theories but in practices. The structures are not there as given; on the contrary, they are constantly being constructed. As a result, they are also changeable and unstable. This has an impact on how one should conduct research from the social studies of science and technology perspective. Law writes: "[ANT] is a method (or better, a sensibility) that has to do with and explores relations, relationality." (Law, 2000). He continues: "… it's the analyst's job, at least in part, to explore how those relations – and so the entities that they constitute – are brought into being." (Law, 2000). This idea of relational entities is a strong reminder of the fundamental idea that our worldview (the so-called modern one) is based on the fixed categories of humans and non-humans. It is exactly these boundaries that ANT wants to avoid and abandon. John Law says, referring to Karl Marx, that "all that is solid melts into air. Humans and non-humans, technical and social, all the rest. If differences exist it is because they are generated in the relations that produce them. Not because they exist, as they were in the order of things." (Law, 2000). John Law retains the core thought behind ANT, that "all entities are initially (only initially) equal and indeterminate." (Law, 2000).

We can ask about the concept of network in Law's thinking. ANT originally intended to use the notion of network as a metaphor in order to describe and analyse rela-

tions between heterogeneous entities. This is exactly what John Law still says, when answering his own question: "What is right with networks? …they are indeed a way of talking and exploring radical relationality." (Law, 2000). Parallel to this statement, Law states, however, that there are many things that are wrong with networks. He mentions three of these: hegemony, collusion and performativity, and functionality (Law, 2000).

John Law writes rather sarcastically: "…if people are no longer so keen to talk about systems, then the term 'network' is on everyone's lips." (Law, 2000), from Al Gore via Bill Gates to Manuel Castells. Where do we end up? Primaly in superficiality, if we follow John Law's tracks. We can use the notion of network to describe the sociotechnical, and that is comforting as Law summarises it. If our aim is that "we are simply in the business of discovering the truth about society and its technologies, no more, no less. Our job is to represent the world as it is. End of story." (Law, 2000). Beyond uncovering the truth, the comfortable level, there is something that greatly worries John Law. Let's listen to him: "We are reproducing the ways in which current orderings of the world are like to represent themselves…And it immediately poses the question: what has happened to social criticism?" (Law, 2000). ANT's own (research) political alarm bells start ringing. John Law asks us to think seriously of our own responsibilities and (political) positions.

These are the aspects Law develops further when he moves on to talk about collusion and performativity. He initiates a discussion concerning what research is producing and how, by reproduction, it also colludes with the world. He uses his own research on the military systems project as an illustration of collusion and reproduction. When talking with people involved in the aircraft development program, he found that there were two expectations of his study. Firstly, to tell and document why the project failed; and secondly, how his information and knowledge could be implemented in new and similar projects to prevent new failures. These thoughts made John Law anxious. As he says: "I certainly did not want to add to the British capacity for building nuclear bombers." (Law, 2000). Beyond this political and moral concern, there was one more thing about this project and his own personal involvement that Law takes up in his article. He found, namely, that the terms he as a researcher doing ANT was using were the same as those involved in the military project itself were using. His analysis could describe the world as it is (as is the case here) and beyond this there were additional elements, such as "power, strength, plausibility and lustre to those assumptions." (Law, 2000). This also happened in Law's case, when he thought about the consequences and further uses of his research. We never merely describe, we also perform: "every description, however subtly, tends to help bring into being what it describes," (Law, 2000) he writes. The notion of network is not an innocent one, and remembering what Law said about the analyst's work earlier in this paper, it is the analyst who reveals and uncovers these networks; and it is the analyst who also chooses where the boundaries of the networks are drawn.

The last critical argument against the notion of network concerns functionality. Here Law refers to ANT studies from the 1980s. These studies were based on the idea of a network with a central node, using some of the ANT concepts in a very functional way, such as the obligatory point of passage, and drawing things together. When placing actors and acts in networks everything becomes explainable; everything seems to have a place of its own and a role to play in the network. Relations in networks are made to work smoothly. I can understand that the critical remarks concerning managerialism, along with functionalism, are partly dependent on the issues and topics ANT studies have chosen to investigate. ANT studies have often looked at innovations and large systems – large in the sense that there were a lot of actors and relations involved. It seems that the aim of many earlier ANT studies was to explain why some networks were successful in gaining stability. When reading ANT texts from this perspective, it is not difficult to identify managerialist and functionalist criticism.

After this rather severe critique, one might ask what John Law thinks about ANT in the year 2000. Is he willing to keep to it, or does he want to throw it away? I would say that the answer is both 'no' and 'yes'. John Law writes: "…in the present context I'm not particularly interested in trying to save actor-network theory." (Law, 2000). What he means here, as I understand it, is that one should not carry on doing ANT research as it was done in the 1980s and end up in the impasses Law has already identified: collusion, performativity, reproduction, managerialism, and functionality. However, he does not leave us without assistance; instead he offers a new direction by which we can keep the fundamental epistemological and methodological issues of ANT and at the same time avoid the critical mistakes of the past. It is Donna Haraway he chooses as our guide in following this new direction. The cyborg metaphor in particular seems to offer possibilities to other logics and different kinds of politics, the ones John Law is looking for. When we talk about cyborgs (á la Haraway) we are talking about human/non-human connections, which are at the very heart of ANT thinking. The cyborg is not a single thing, it is about partial connections. It is at the same time real and unreal, both science fact and science fiction. Donna Haraway adds political radicality to this combination, by showing the cyborg hybrid to be feminist, non-racist and non-violent. We are thus far away from single visions, and drawing things together. Instead, we have partial and split visions. These visions can be partly joined, but they are also partially separate. We have the famous words of Donna Haraway: "…more than one but less than many." (Law, 2000).

This is what John Law wants: "a non-foundational but material relationality that is not functionalist. That does not distinguish between the political…and the technical. That does not presuppose a metaphysical distinction between the human and the non-human. But rather one which opens up possibilities for thinking about and performing alternative realities, alternative versions of the good, and alternative sensibilities to Otherness." (Law, 2000). What becomes central to this version of ANT is mobility, displacement and accountability.

The year 2000: Fluid and Fire

How did the ANT writers respond to the concerns of limits and limitations connected to the functionalistic model-wise use of the network metaphor? The final article I explore in my paper is from the year 2000 (Law & Mol, 2000). John Law together

with the Dutch philosopher Annemarie Mol is carrying on his critical review of ANT by taking as his starting point the notion of the network. They go back to John Law's article about the Portuguese vessels of the 16th century and ask why it was so important to explain the stability of the network. Law and Mol's article is an invitation to elements causing tensions in networks. In order to talk about instability, Law and Mol use four different spaces as necessary and possible metaphors. They introduce the metaphors of fluid and fire (Law & Mol, 2000) providing a possibility and challenging us to think about changes and instability beyond the stability and immutability provided by the network metaphor.

The four different spaces are: the Euclidean space, the network space, the fluid space of fluidity and finally, the fire space. In addition to the different spaces, the article is about immutable and mutable mobiles. It is also a contribution to, and one step further towards, the 'actor network and after' (ANTa) perspective.

How and why should one talk about spaces in an ANT context? In order to give some answers to this question we must first talk about shapes and mobility. Law and Mol start by talking about how ANT and even other studies of science and technology have discussed scientific facts. In the past, as Law and Mol express it, we did not ask where scientific facts were born, or where they came from. Then the focus of research shifted from the facts-are-taken-for-granted approach, unquestionable and valid in all places to following how science is actually done and practised. We have the science-in-action approach. Instead of seeing science as a work of lonely geniuses, scientific studies showed us that science is a practice among all other practices. Science was "brought down to earth." (Law & Mol, 2000). After working with how is science done, the next question to be asked was, where it is done? Researchers moved to laboratories. Law and Mol refer to research done by, among others, Bruno Latour, Karin Knorr-Cetina and Michael Lynch (Law & Mol, 2000). We have scientific facts localised in specific laboratories. In a sense, the facts travelled from universalism to specific locations.

However, the facts do not remain in one place. They "travel and move around." (Law & Mol, 2000). To establish how they do this, we must look for empirical answers, Law and Mol claim. They suggest that we should look, for example, at postal systems and other means of transport. Whatever the distance the scientific facts then travel, the crucial point is that they are still treated as scientific facts. Otherwise they would not be regarded as scientific facts. They would simply turn out to be "meaningless pieces of paper." (Law & Mol, 2000). If scientific facts are going to stay as scientific facts wherever they are transported to, it is essential that the new destination of the scientific facts also gives them the status of scientific facts. If we use Law's and Mol's formulations, we end up with the following statement when talking about keeping scientific facts as scientific facts in different locations: "*…the configuration of facts-and-context has to be held stable.*" (Law & Mol, 2000. Italics as in the original text.) This stable configuration necessitates that the travelling scientific facts must keep their original shape. It is exactly this that Bruno Latour means when he introduced the notion of immutable mobiles. Here Law and Mol for the first time in this article give the reader an insight into what ANT is: "This concern with transport and the work holding

configurations together and in shape – with the so-called 'immutable mobiles' – was to lead to what became known as actor-network theory." (Law & Mol, 2000). The network demands stability. It demands that things keep their shapes. When exploring John Law's article about the Portuguese vessels, we talked about the conditions for long-distance control; how to make the ships sail to India and return. What made them immutable mobiles? What was holding the ships together even under difficult weather conditions, the enemies out of the vessels, and the skilled seamen loyal? What kept the heterogeneous network – the vessel – together? Law's answer to what was, and still is generally needed when talking about long-distance control and immutable mobiles, are devices, documents and drilled people. The ships were mobile because they actually travelled to India. At the same time, they were immutable; the heterogeneous network relations were stable. The ship was the same ship all along.

Law and Mol actually use the Portuguese vessel article as an example with which to illustrate the first two spatialities, the Euclidean and the network spaces. The Euclidean space consists of co-ordinates which are three-dimensional. If the relations between these co-ordinates are kept constant, the space keeps it shape. We can understand this definition if, instead of Euclidean space, we talk about geographical space. The Portuguese ships, for example, could move in a geographical space because the internal relations between the co-ordinates did not change.

The second space Law and Mol talk about is the network space. It is the ship itself: the relations between sails, navigational instruments, and seamanship. If these relations are kept constant, then the ship is an immutable mobile. It can move in the geographical space but the relations between the different actors of the vessel, both inside and outside of it, need to be kept constant. If not, the network will break down. What Law and Mol want to suggest is, in fact, that it is immutably mobile at the same time as it is immutably immobile because "everything stays in place: the relations are sustained in a stable manner." (Law & Mol, 2000). Returning to the Portuguese vessels, we can draw the conclusion that of the spaces discussed so far, it is only in the geographic Euclidean space that the vessel is mobile. In the network space, it is immobile.

This is something we already know, or at least can understand, when we read Law's and Mol's article against the background of the ANT texts presented in this paper. The very pre-condition for a network, such as a ship, is immutability. If things start to move and change, the sails break down, the seamen rise in mutiny, the relations between the entities change and as a result, even the network – the ship will change. The central ANT notion of the network demands that the relations between the entities are unchangeable to ensure that the order is stabilised. Law and Mol summarise the criticism raised against how ANT studies have used the notion of network in two statements. First of all, they take up the notion of network: "…though it is hardly the fault of actor-network theory, then notion of 'network' is so common that it is being denuded of much of its specificity and is in danger of becoming hegemonic." (Law & Mol, 2000). Here I can recognise my own experiments in ANT analysis. The overwhelming risk is that ANT can be minimised to a model where the empirical findings must in one way or another fit in. The sensitive mode of analysing can easily be

interpreted and implemented as a very vulgar instrumental tool. Everything is about networks. The networks are not used as metaphors but as highly concrete schemes which demonstrate a logical and functional structure of actors and actions. This is the very same criticism that Bruno Latour took up in his article "Recalling ANT", where he suggested that the whole notion of network should be abandoned. (Latour, 1999, pp. 15-16). Secondly, Law and Mol also maintain that: "in earlier versions actor-network theory tended towards a functional managerialism." (Law & Mol, 2000). This tendency concerning functional managerialism has, as I understand it, a direct connection with the notion of network. If we use the network as a point of departure or as a basis for our analysis, we are actually looking for stability and structure. It is the network interpreted and used as a scheme or a pattern that drives us to construct stability and structure. In the end, we become highly insensitive to phenomena that do not fit into our networks. Perhaps we do not even recognise the phenomena that do not fit into our more-or-less harmonious and symmetrical networks. We are so eager to identify actors, both human and non-human (we are anyway doing ANT research) and drawing things together that we become blind to things that strive away from our networks, to everything that is different, difficult to identify and give names to, and to divergences. How should we talk of them in the context of network, which is often based on the idea of a centre?

This one-dimensional, poor and non-flexible use of network was absolutely not why ANT originally chose the notion. The network was a metaphor intended to be used when talking about relationalities. Actors become actors only in relation to each other; an actor is, in fact, an effect of these relations. In this sense, network was used as a strong metaphor to oppose the structuralist thinking which was dominant in many theories and schools of social sciences and social studies of science and technology at the time. It is exactly here Law and Mol introduce the two other spatialities: fluid space and fire space (Law & Mol, 2000). They can be used as new metaphors that give more space to relations, divergences, and otherness(es).

Before we start to explore the notion of fluid space, I want to summarise some things concerning the shape of the network in Euclidean and network space. The prerequisite of a network if it is to move in Euclidean space is that the network must keep its shape. Inside the network the shape stays unchanged. It is both immutably mobile and immutably immobile. In both cases, the network keeps its shape. The metaphor of a network is not able to handle networks that change their shapes. The network metaphor is, indeed, based on the idea that the network keeps its shape. It would not be a network if it were not an immutable immobile. What Law and Mol want to suggest is that not all networks keep their shape. As an example, they take the case of the bush pump project. Law and Mol write: "Of this pump and everything that allows it to work, nothing in particular necessarily holds in place. Bits break off the device and are replaced with bits which don't seem to fit in. And other components – we're talking here both parts of the 'machine itself', and the social relations, village relations, embedded in it – are added to it, components which were not in the original design itself." (Law & Mol, 2000). When it comes to the original idea of a stable network, the bush pump does not fit in, in terms of networks because it is a 'mutable mobile'

(Law & Mol, 2000). The obvious question becomes: Is the bush pump the same pump when it changes shape? To answer this question, Law and Mol suggest some more refined subquestions. What the bush pump was originally developed for was to produce clean water. Does the modified pump do this? Well, it depends what we mean by clean water, Law and Mol answer. The criteria for clean water are variable. There are also other variations, connected, for example, with the political situation of the country to which the pump travels. What Law and Mol wish to claim is that the bush pump is still a functioning pump even when it differs from the original in a number of ways. But it is working, it has not broken down. These changes are not abrupt and sudden, but happen 'gradually and incrementally' (Law & Mol, 2000). This is remarkable when it comes to this new third space, the fluid space: "…a world in which shape continuity *precisely demands* gradual change…" (Law & Mol, 2000. Italics as in the original text). The fluid metaphor invites to think about gradual changes; the moves between the stability and instability, so that the phenomena can actually both keep some dimensions of its shape but there is also room for changes dependent on the contexts where the phenomena is located and situated.

The fourth space Law and Mol talk about is that of the fire. So far we have been talking about spaces without changes (geographical space and network space), and about gradual changes (fluid space). Law and Mol introduce the new space, the fire space, because they wish to have a metaphor that is capable of including 'abrupt and discontinuous movements' (Law & Mol, 2000). The fire space metaphor is also necessary when talking about relations between what is absent and what is present. We are introduced to new kinds of continuities as compared with those connected with network space and fluid space, namely "transformative continuity, continuity as the presence and the absence of Otherness and finally a star like pattern to his simultaneous absence and presence." (Law & Mol, 2000). When we talk about networks we concentrate on the actors that are present in the networks, and in a way the actors are not connected to entities and elements outside the defined and closed networks. At the same time, as Law and Mol suggest, the very existence of the network is dependent on elements that are not present. To illustrate this they present a mathematical formula used to count the gust response of an aeroplane construction. The signs used in this formula are representations of absent elements, such as pilots or Russian bombers. The network, the formula and the actual construction of the aeroplane are "a complex association between that which is present in the expression and that which is not. In short, it loses sight of Otherness." (Law & Mol, 2000). The formula would not be possible without that which is absent, and it is also made possible by that which is made absent.

What consequences does fire-space thinking have for empirical ANT research? What the fluid and fire space metaphors provide is the opportunity to think about what actually makes up network space; what is actually absent, and what is present. These new metaphors demand a new kind of sensitivity and awareness of varieties, alternatives and disconnections. Are some networks possible because some elements are excluded from the visible networks, in the same way as visible work is made possible because of a huge amount of invisible work? (see e.g. Star, 1991a, Star & Strauss, 1999).

A.2 ANT & ANTa – Both And or Either Or?

My intention is not to draw a firm dividing line between ANT and ANTa. It is vital to bear in mind that neither ANT nor ANTa is one single thing (see e.g. Law, 1997). At the same time, it is justifiable to use these approaches as two nodes. When travelling from one node to another, it becomes clear that there are several points that make it legitimate both to talk about ANT and ANTa as separate approaches and also to claim that ANT and ANTa co-exist on the same line. The line between the two nodes tells a story about development and change rather than a story of separation.

Let me summarise by making some more general remarks about what it would mean to move sometimes between ANT and ANTa, and sometimes perhaps leave ANT behind and vice versa. There is no need to be categorical, but rather quite pragmatic. It is, after all, an empirical matter.[5] There are no universal truths either about ANT or ANTa. The only way of talking about ANT and ANTa is to bring them into the world. The following short summary (see figure 1) is, of course, unfair to both ANT and ANTa because it is an oversimplification and reduction, although I hope that it captures some of the core issues of both ANT and ANTa.

ANT	ANTa
Tells empirical stories	Tells empirical stories
Focus on relations between heterogeneous human and non-human actors	Focus on relations between heterogeneous human and non-human actors
Metaphors are important (network)	Metaphors are important (fluids, fires)
Stability is the focus of the ANT-based research	Instability is the focus of the ANTa-based research
ANT-based network stories are often one-dimensional smooth stories	ANTa-based fluid and fire stories are rough, multi-layered stories
ANT stories are functionalist stories, in need of reductions and simplifications	ANTa stories are 'It could be otherwise' stories respecting complexities
View from nowhere-storyteller	Situated storyteller
Successful translations	Contradictions and controversies
Draws things together	Draws things apart

Figure 1 Moving between ANT and ANTa

As mentioned earlier in this article, a lot of internal and also external criticism (see e.g. Grint & Woolgar, 1997, pp. 28-31, Haraway, 1994, Haraway, 1997, pp. 33-35, Ormrod, 1995, pp. 31-47, Star, 1991b, pp. 26-56) has been raised against the texts produced in the context of ANT.

[5] Thanks to John Law

In my study, I have been inspired both by Actor-Network Theory (ANT) and feminist technology and technoscience studies. This collaboration is regarded by some feminist researchers as a dirty and contaminated business. One of the opponents against ANT is Susan Leigh Star, who in her famous article from 1991, where she takes her point of departure from her personal allergy to onions, accuses ANT of constructing a 'managerial and entrepreneurial model of actor networks' (Star, 1991b, p. 26). According to Star, much more effort should be put into studying entities that do not have access to the stabilised networks of humans and non-humans. We are not all included in the processes of stabilisation. If you are allergic to onions, it really does not matter if it takes five minutes to order a hamburger; it does not matter if there is an automatic door opener if you are not tall enough for the opener to react. Much more care should be put into the examination of the exclusion processes, which according to Star affect mostly humans and their internal power relations.

Some years after Star's article, ANT researchers themselves started to articulate similar concerns when discussing the present state of ANT and ANT-inspired research. They even used the same vocabulary in their own critique as Susan Leigh Star. ANT stories have been infected by hegemony, functionality and managerialism (Law, 1999). However, during the last five years, ANT has found alternative metaphors to the notion of network that evidently has had a tendency to allow itself to be used as a static model. The new metaphors, such as fluid and fire, have made ANT more sensitive and able to include instability in its analytical perspective, and thus ANT can also start to embrace tensions, contradictions and roughness. So in a way ANT itself has provided answers to the question raised by Susan Leigh Star and many other feminist researchers (see e. g. Haraway, 1991, 1997, 2003, Mörtberg & Elovaara & Lundgren, 2003): 'Could things be otherwise?'. The new metaphors make it possible to tell different stories than the hegemonic ones and thereby relate that things are actually already otherwise. Networks or heterogeneous relations can be stable and unstable at the same time. But of course the question raised by the feminist researchers also implicitly includes a wish and yearning for change, to construct networks on other premises than perhaps the ones most of the sociomaterial relations are built upon today. This was not an issue of the original ANT research or its later development (ANTa), but nevertheless both ANT and ANTa provide analytical resources to visualise and thus make the existing networks visible. They also highlight the actors who do not necessarily have access to the networks by enrolment and also those for whom these networks do not mean smoothness in everyday life but rather 'chaos and trouble' (Star, 1991b, p. 42). Also the way ANT/ANTa extend social relations also to include non-human actors – be they machines, software, computer networks or money – is a prerequisite for understanding the current western societies, because the amalgamation between the humans and non-humans is so tight that it would be both ignorant and dangerous not to take our non-human companions seriously and initiate a dialogue with them. But here perhaps the chaos and trouble aspect sometimes wins and we simply do not voluntarily want to be associated with those entities that in our everyday lives seem to work against us.

Nevertheless, it is important to take the critique raised against ANT seriously. When telling my stories as told in this dissertation, I wonder how much space have I left

for those actors who are not self-evident participants in the networks. The criticism is not (only) about the hegemonic character of the networks because some networks actually function on the basis of exclusions or not having the capacity to include the multiplicity of voices and experiences. Ultimately, it is the researcher who has the power to decide the complexity of the network and also how linear and functional the stories thereby become, because in stories it is possible to create space also for those entities that exist on the edges of the stable and stabilised networks, by telling about instabilities as well, because they always exist beyond the formal networks. The absent is always present (Law & Mol, 2000).

One more point that teases me is if I in my attempts at inclusions have brushed away conflicts and contradictions, do my stories then give more space to practices than they actually have outside my story telling? Do I idealise the space available for the action and agency of information technology?[6] The balance between inclusion and exclusion is not always that clear and simple.

Annemarie Mol and John Law take the criticism even further and connect it more broadly to writing academic texts: "The texts that carry academic stories tend to organize phenomena bewildering in their layered complexity into clean overviews. They make smooth schemes that are more or less linear, with a demonstrative or an argumentative logic in which each event follows the one that came before. What may originally have been surprising is explained and is therefore no longer surprising or disturbing. Academic texts may talk about strange things, but their tone is almost always calm" (Mol & Law, 2002, p. 3). The criticism here raised against academic writing in general has the same main components as Law's earlier criticism of ANT. There is a risk of creating linear texts that order not only the text but the phenomena the texts are about in a linear way where the phenomena have a beginning and an end.

If there are grounds to accept the criticism levelled at one-layered, ordering, linear stories and also to take seriously the problems connected to the network as a model of stabilisation, how then to write other kinds of stories with new metaphors becomes the central question when talking about scientific writing. What John Law suggests is a new metaphor for a multi-layered and many-dimensional writing. "…then multiple storytelling makes rhizomatic networks that spread in every direction…This results in texts that are uncentered, texts that are not singular." (Mol & Law, 2002, p. 3).

How is it possible to write rhizomatic scientific stories containing resistances, difficulties as well as possibilities? Can one scientific story be both smooth and rough at the same time? How can we build in more than one dimension in a one-dimensional medium? How can we write a story that is both closed and open? There are no simple and universal solutions to the many questions, instead they must be both formulated and answered constantly and in a manner that supports diversity and difference in writing and presenting empirical studies (See e.g. Singleton, 1996, Mol & Law, 2002).

[6] As a response to my question see e. g. Green, E. & Owen, J. & Pain, Den (1993), who discuss a computer project conducted at a English city library, where the librarians employed were excluded and overlooked in the project.

Within feminist technoscience research, the transparency of scientific work and its representations has also been discussed and problematised. If we no longer want to accept the universality and generality of science in the sense that science retells and reproduces reality and that this retelling and reproducing are always objective and true, we tend to end up in a position where "how something is written becomes important in consideration to what we are going to write about." (Landström, 1998, p. 44). The dream of telling universal, scientific, true stories from a view from nowhere, the god-trick as Donna Haraway, an American feminist technoscience researcher, calls it, is broken (Haraway, 1991, p. 189).

Donna Haraway speaks about situated knowledges, which do not refer to a place but instead to what she describes as situatedness (Haraway, 2000, p. 71), to the epistemological consciousness (Haraway, 1991, p. 196). A story is always a manifestation of partial perspectives, in the sense that there can never be one single story explaining everything. The partiality and situatedness lead to the understanding that there is no way of talking about knowledge in a singular form; one has to refer to knowledges as a plural. How can one be situated and positioned without being innocent and blind becomes a question of how to join the partial perspectives, and how to relate the partial stories to other such stories. Donna Haraway states that we need to know: "… how to have simultaneously an account of radical historical contingency for all knowledge claims and knowing subjects, a critical practice of recognizing our own semiotic technologies for making meanings, and a no-nonsense commitment to faithful accounts of a 'real world', one that can be partially shared and friendly to earth-wide projects of finite freedom, adequate material abundance, modest meaning in suffering, and limited happiness." (Haraway, 1991, p. 187).

John Law talks about the researcher's accountability: "This is a chapter. An article. Or a paper. Let us take note of that. But the business of writing – and talking – raises serious problems. Difficult questions. Questions to do with materiality, method, knowing, representing and signifying. Questions of authorship, authority and the nature of our field. Questions concerning the character of what it is to be an expert in 'our' field." (Law, 1998, p. 88). John Law's words summarise many of the aspects of writing that make writing such a difficult business. He really asks what it "mean[s] to narrate – that is to write or give a lecture" (Law, 1998, p. 90), and one should also add, what it means to create "formulas, diagrams and tables" (Mörtberg, 2000, p. 56).

Feminist technoscience studies have from the very beginning had a strong affiliation to issues concerning accountability. Donna Haraway, for example, uses the term "antiracist multicultural studies of technoscience" (Haraway, 1994, p. 69). One could claim that many of the earlier ANT studies in particular have had a touch of 'standing nowhere and seeing everything'. Now that ANTa-inspired texts openly criticise ANT for not taking issue with, for example, accountability under more careful and conscious consideration, the distance is slowly shortening. Neither ANT nor ANTa is static or monolithic, both are starting consciously to implode and change.

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Chapter 3. Information Technology – Are Women Outsiders and/or Insiders?[1]

Background

What is information technology (IT) all about? What kind of interpretations and understandings of IT are articulated and formulated in the Swedish context? How are inclusions and exclusions described and presented? How is gender equality discussed? How are (new) possibilities and (old) obstacles discussed? By choosing to introduce my article by asking these questions and by choosing the title "…are women outsiders and/or insiders", readers might feel that there is a risk, danger or chance that I am going to present a highly qualified gender equality information technology manifesto. I must therefore stress that this is not the case; rather my intention is to present a paper that tolerates interpretation as both a provocation and/or an invitation to discussion and debate.

Cartography number 1

In March 1996, a Swedish government bill called "Measures to broaden and develop the use of information technology" was submitted. (Regeringens proposition 1995/96:125). The bill launched the following definition of the concept of information technology: "IT is a generic term for different kinds of technologies that can be used to create, store, process, transmit and present sound, text and image. IT makes these activities and processes possible, independent of the amount of information and geographical distances." (Regeringens proposition 1995/96:125).

Four years later, in March 2000, the next Swedish IT-political government bill was submitted, called "Information society for all" (Regeringens proposition 1999/2000:86). This bill adopted the same definition of information technology as the previous government bill from 1996, but added some new dimensions to the previous IT definition. Using the IT definition as a starting point, the bill went even further and also discussed educational programmes and professions that the bill classified as IT educational programmes and IT professions. As examples of such programmes and professions, the bill mentioned educational programmes such as "… computer engineering/computer science, electronics/electrical engineering, management information systems/informatics, engineering physics and other IT educational programmes" and consequently professions such as programming, systems development, systems design, networks technology and technical support in general.

In the same year, 2000, but some months later in June, the Swedish state committee 'Jämit' or 'The Gender Equality Council for Transport and IT' published its sub-report 'Gender Equality and IT' (SOU 2000:58). This committee started its work in autumn 1999 and had as its aim among others "to follow and analyse gender equality issues in the IT and transport sectors, in both short and long term per-spectives." (SOU 2009:58, p. [1]) And what did this committee discover? First of all, the committee adopted the definitions of information technology, IT educational programmes and IT professions launched by the two government bills discussed earlier in this chapter. After studying the numbers of female students in IT educational programmes and women active as IT professionals, the committee came to the conclusion that "…information technology is a male domain." (SOU 2000:58, p. 19).

How did the committee end up at this conclusion? Keeping in mind that the committee adopted the technically focused definition of information technology, it is not surprising that the committee concluded that there is an absence of women. In Sweden the number of women studying computer science, systems development, software engineering and other educational programmes regarded as IT programmes, is low. To take just one example; of all the students studying civil engineering with a computer science profile, about 19% were women during the study year 1998/1999.

I want to summarise my reading of these three official Swedish IT political texts by stating that according to these three IT political texts, information technology is a technical field and in order to be able to act in this field you have to have a technical education leading to a technical profession. The chain of connections is straight and linear, from one point to the next, from technology to gender inequality. It is consequently evident and understandable that in Swedish official discussions and debates concerning information technology and gender equality, the focus lies partly on the absence of women and partly on the measures (for example information campaigns targeted at women) in order to make women become more interested in technical disciplines and education.

Cartography Number 2

In Spring 2000, at the same time as the gender equality and IT committee was compiling information for its sub-report, Anna was working as a librarian at an educational institution. She was allocated funding for a project aiming "to deepen and develop co-operation between educational courses and the library, to integrate the methods of information searching in the educational work, and to use the possibilities of Internet technology to strengthen communication between students, the library and teachers."[2]

In Spring 2000, Eva was also working as a librarian, at another school. She was asked by the head of the school to create web pages that would work as a front page for the school on the Internet.

[1] A longer version published in Karstensen, G. (Ed.) (2002) Subjekt, politik och könskonstruktion: det jämställda Sverige som framtidsverkstad. Rapport från en nordisk forskningskonferens 28.1-1.3.2002, Stockholm. Oslo: NIKK, pp. 55-58, and Mörtberg, C. & Elovaara, P. & Lundgren, A. (Eds.) (2003), How to make a difference?: Information technology, transnational democracy and gender, (pp. 21-28). Luleå: Division Gender and Technology, Luleå University of Technology

[2] The original project application, dated 19th of November 1999

At the same time Sara was working as a virtual school librarian, which meant that she and the library services were available for a great number of elementary school pupils mainly via e-mail and the digital library services she had created.

Inger was participating in a European Union financed library project, which was mostly directed at small and medium sized businesses, but which also had as its aim to develop democratic IT rights for citizens by building up non-profit IT studios and arranging Internet training courses for senior citizens.

Four themes are interweaved with the four stories of these librarians and their IT practices. Theme number one: Local understandings of the national information technology politics or How the national becomes local or How the dominating IT discourse is translated into local practices. All four stories are examples of how IT politics is translated (read: transformed) into everyday IT practices. They show how local practices are welcomed because they are needed in order to strengthen and anchor the political goals of information technology in Sweden: IT should be integrated in all sectors of society in the true spirit of 'folkhemmet'.[3] The local translations and transformations of the national IT politics are supported, stimulated and encouraged by public funding of projects and other local activities.

Theme number two: Negotiating competence and expertise. By initiating IT projects, designing and creating web sites, organising IT courses and constructing IT studios, the four librarians became extremely visible when crossing the boundaries of competences and power. They actually showed that there is space for individual initiatives and ideas and for new competences. Their IT related work started processes that led to the existing structures and routines beginning to shake and show their vulnerability. What actually happened when the librarians started to work with computers, information technology and the Internet was that they were conquering new spaces of action at their work places. They could also bring together the traditional work practices of librarians (like structuring information and mediating between people and information) with new information technology and at the same time strengthen the democratic roots of the Nordic public library ideology.

Theme number three: Transgressing the organisational borders. When the four librarians started working with computers and technical staff, they needed the support and co-operation of their colleagues and other professions and to collaborate with them. Their claims and needs rendered visible the invisible but strong shadow organisations and also started to question the organisational power structures. Creating web sites and other IT implementations meant that they were allowed access to a landscape where it was possible to create new alliances and collaboration. But if the existing organisations are not based on co-operation and collaboration, how to build new alliances and possibilities?

And finally, theme number four: To make women's work invisible. In the four stories, all the librarians are women and real enthusiasts and pioneers who feel rather alone in their own organisations with their ideas and visions. When we discuss local interpretations and practices of information technology, we are discussing women: librarians, teachers, health care personnel, administrative personnel. And when I mirror these women in the official IT documents, it is quite apparent that these women are not encompassed by the official definitions of information technology. By contrast, they are made invisible in the official texts and thereby classified as outsiders in the IT discussions. Their expertise and experiences are not present in the official Swedish IT political texts.

Implosions

What I would like to suggest is a broader understanding of the concept of information technology, including technologies, local translations and local implementations.

This is a political statement because it turns the Swedish discussions of information technology and gender equality upside down. The way I want to understand information technology is not to focus on the absence of women; on the contrary, I want to focus on the presence of women. Local practioners and implementors often with a non-technical background are as much IT professionals as software engineers, systems developers and programmers.

What would we gain if we expanded the definition? First of all, we would get a definition of information technology that includes women. In saying this, I do not want to suggest that the issue of missing women in the technological field is not a gender equality problem. What I do want to state is that by accepting the narrow definition of information technology proposed by the official texts, we actually exclude all the women-dominated professions that are shaping information technology everyday.

This redefinition is important for at least two reasons. First, it shows respect for all the women who are the everyday IT doers. The world around us is not a pure box as suggested by the official texts, but instead we are surrounded by hybrids. Impure creatures who do not respect the borders drawn in official documents but who bravely, foolhardily and challengingly transgress borders and demand intertwining. Information technology is not done only by engineers, but also by engineer-sociologists as Michel Callon (Callon, 1990, p. 83) calls these hybrids, and librarian-engineers, nurse-engineers and so on. Information technology is much more impure than the definition in the official texts would have us believe. What I want to propose is a re-evaluation of the discussion of absence-presence issues when talking about information technology and gender equality. Why reserve the space of expertise and agency only for men who are present and women who are absent?

[3] See especially Regeringens proposition 1999/2000:86: Ett informationssamhälle för alla. About the notion of "folkhemmet" [the people's home]: This has been the ruling social democratic ideology in Sweden since the Second World War and has roots that stretch to the 1920s (Hansson, 1935). The backbone of the ideology was to build up a strong welfare system that guarantees social benefits, such as child care, health care and school education, for every member of society.

Second, we should not get lost and locked in the absence discussions. Instead or at least alongside them, there is a need to start talking about opening up the black box of information technology. Michel Callon and Bruno Latour write about the black box metaphor: "[a box that] contains that which no longer needs to be considered." (Callon & Latour, 1981, p. 288). The official political texts have looked inside one of the compartments of the information technology black box, described what they have seen and then they closed and locked the box. In so doing, they 'forgot' to look inside in the compartment of the everyday IT practices of the information technology black box. Inside there are practices where the borders between the technology developers and users are not that solid and fixed anymore, or as Randi Markussen says: "As they [information technologies] move from the realm of experts into the workplace and mingle much more intimately with other activities, the idea of computer expertise and the boundaries between developers and users are questioned…" (Markussen, 1996, p. 127).

If the local interpreters, translators and transformers of information technology were regarded as information technology professionals and experts as the ones officially classified as IT professionals and experts, would there be more room and space for discussions of accountability and participation instead? Or is the presence of the invisible groups of IT actors limited to blind messenger girls, whose main task is to reproduce the success story of Bill Gates? Or are the activities and practices of the invisible IT actors directed at sustainable and accountable technology and societal development where responsibility and participation has another and more complex content than merely to disseminate basic computer skills?

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Chapter 4. Living in the 'Belly of the Beast'[1] – Doing Feminist IT Research[2]

"*Dozens of feminist writers have refused both relativism and universalism. Subjects, objects, kinds, races, species, genres, and genders are products of their relating. None of this work is about finding sweet and nice – "feminine" – worlds and knowledges free of the ravages and productivities of power. Rather, feminist inquiry is about understanding how things work, who is in the action, what might be possible, and how worldly actors might somehow be accountable to and love each other less violently.*"

(Haraway, 2003, pp. 6-7)

Introduction

This article takes as its starting point the authors' lived realities, experiences and reflections located at a technical university in Sweden. This for us privileged position provides an opportunity not only to investigate information technology from an outside perspective, but as Lucy Suchman referring to Judy Wajcman writes: "JW suggests that really to understand these processes of exclusion and resistance, feminist scholars need to get inside the 'black box' of technology production: that there is room for an effective politics around gaining access to technological work and institutions, and that there are, as she puts it, 'opportunities for disruption in the engine rooms of technological production' (1991, p. 164)" (Suchman, 2002, p. 101). In this article we want to raise and discuss questions connected to our own practices as researchers and ask: What are the important issues for what we have chosen to call "feminist IT research" now and in the future when situated in the 'belly of the beast'/ in the 'engine room'/at a technical university.

Our research group, Technoscience Studies, engages in research that from feminist research perspectives develops complex understandings of information technology. The members of the research group come from different disciplinary backgrounds, and we want to characterise ourselves, as well as the work we do, as inter/transdisciplinary. Our common aim and interest is for intervention, for transformation and change, in the best feminist tradition.

Research on gender and IT has to a large extent discussed issues of gender in relation to IT, focusing for example on gender equality aspects and social shaping of technology (see e.g. Grint & Gill, 1995; Vehviläinen, 2000). In these studies, IT is often seen as defined, it has been 'blackboxed'[3]. Thus, technology and the underlying perceptions of technology development and knowledge are seldom brought into focus. But what happens if we open up the black box of IT, what new approaches, ideas and understandings can this give, and what new possibilities for change? Looking at, opening up, criticising, but also suggesting and developing technology in different and perhaps unexpected ways can contribute to the feminist project in and about technology. Paraphrasing Sandra Harding's concept of "the science question in feminism" (Harding 1986), we see feminist IT research as constituting a turn towards "the technoscience question in feminism". Feminist research here should not only be on information technology as something defined and ready-made, but also an active participation in research in and around information technology.

This text is also about imagining and dreaming of feminist IT research. But it is also about experiences and lived practices. It is about realities where smoothness and roughness co-exist and create tensions that both tear and inspire. We also write about moving and being in movement. About change. About intervention. About being inside, outside and inbetween in our own sociomaterial arrangements. All at the same time. We write about stability and instability. This article is about boundaries, transformations, transitions, interventions and disruptions.

Problematic Boundaries in the "Engine Rooms of Technological Production"

"My experience of the working relations of technology production and use has led among other things to a preoccupation with boundaries, including efforts to recognize them, problematize them, at times maintain them, and at other times to work across them."

(Suchman, 2002, p. 93)

Since 1998, when the research division of Technoscience Studies, with its roots in gender and information technology research, was established at Blekinge Institute of Technology, Lucy Suchman's words have inspired us to identify the categories (see below) surrounded by numerous boundaries in order to analyse whether the boundaries work against us by limiting our working and transformation space. Suchman also invites us to explore what it would mean to transgress and blur the problematic boundaries.

Boundaries create classifications and categories, spaces to live in and act from. Bowker and Star describe the phenomena and practice of classification: "A classification is a spatial, temporal and spatio-temporal segmentation of the world. A "classification system" is a set of boxes (metaphorical or literal) into which things [we would like to add: people] can be put to then do some kind of work – bureaucratic or knowledge production." (Bowker & Star, 1999, p. 10). "Classifications are consistent and unique, mutually exclusive and complete." (Bowker & Star, 1999, pp. 10-11).

A university is an arrangement based on categories and classifications that fits well into Bowker's and Star's description. In our cartographical work, when identifying the boundaries and categories inside the technical university, the following four boundary-based categories seem to be the most troublesome and powerful:

[1] We send a vote of thanks to Donna Haraway.
[2] By Christina Björkman, Pirjo Elovaara, Lena Trojer
[3] "A subject to blackboxing, a process that makes the joint production of actors and artefacts (and activities) entirely opaque." "Can we open the labyrinth and count what is inside?" (Latour, 1999, p. 183)

a. The university structure is based on disciplinary boundaries – difficulties when developing inter- and trans-disciplinary research
b. The university definition and understanding of information technology as a hardcore technical category – difficulties when aiming for extension and broadening the understanding of information technology
c. The university category of knowledge is often connected only to theoretical knowledge produced at academies – difficult to respect and co-operate with other knowledge producers outside the university
d. The university as part of the academic world is a closed classification system based on mutually exclusive categories – little or no space for change.

Categories and classifications are named, listed and articulated as disciplines, departments, academic titles, professional positions, research areas, etc. These categories provide a repertoire of labels which help you to describe yourself and also find others belonging to the same categories, as if we were participating in a blind-date meeting with our labels and looking for partners with similar interests, backgrounds and experiences. Smooth orderings and stabilisations. These categories, and the boundaries between them, are a living reality, not just constructions, and are most tangibly present in attempts at inter/transdisciplinary work. Lucy Suchman concludes that disciplinary distinctions "all orient not only to different problems but more significantly to different, sometimes incommensurate conceptions of the social/technical world." What hinders us, she says, are "discontinuities across our intellectual and professional traditions and associated practices." (Suchman 2002, pp. 96-97). The problem with boundaries between different communities is also discussed by Donna Haraway: "…but we do need an earthwide network of connections, including the ability partially to translate knowledges among very different – and power differentiated – communities." (Haraway 1991, p. 187).

This is related to difficulties encountered in broadening the understanding of information technology, where the issue of knowing within categories is raised: "A crucial assumption underwriting these persistent boundaries is the premise that technical expertise is not only a *necessary*, but is the *sufficient* form of knowledge for the production of new technologies." (Suchman 2002, p. 93, original italics). Since categories are mutually exclusive, if you are placed inside a technological discipline, you cannot at the same time be categorised as a social scientist, and vice versa. Being inside one specific category means that you are firmly and definitely outside another category. This leads to an attempt to understand who is outside and who is inside when the borders are drawn, and what it means to be outside and inside when talking about power to define and power to do.

The university as a complete and closed classification system means that no spaces exist in-between. To a large extent, this disables possibilities for the kind of change and transformation work that needs to be done outside or between categories. There is a need for a place for security and change, a need for a 'home'. The function of a

'home' is as a place to rest, to develop your own thinking, to charge your batteries, but also to prepare for intervention and change. A home makes it possible to be in motion, it renders change and intervention possible. To be without a home, to be homeless, an outsider, might sound like a romantic position, but only to those who have a home. According to Star, 'being homed' means that "I have an ordered supply of food, clothes and tools upon which to draw without having to think about it at the moment; in planning and ensuring the supply; I know that I have a place to put them. Being homed means that I can pass through the innumerable interactions that complex state bureaucracy requires; giving my name, address and social security number; without being ashamed…Being homed means that I can come and go, and during my absences my supplies and address will remain more or less constant…" (Star, 1996, p. 42).

When knowing of and living with(in) boundaries you also start wondering how powerful, well protected and stable these boundaries are. Or are they transgressable? Donna Haraway says in an interview: "Categories are not frozen…The world is more lively than that, including us, and there are always more things going on than you thought, maybe less than there should be, but more than you thought!" (Lykke & Markussen & Olesen, 2000, p. 55). The nomadic subject (Braidotti, 1994) is also a possible and testable figuration and position showing that transgressing is possible, but also a difficult task because above all it demands epistemological and political consciousness. (Braidotti, 1994, p. 2)

Transgressing and blurring boundaries

"…crossing boundaries as a project of mutual learning and partial translation…"
(Suchman, 2002, p. 93)

Our inter/transdisciplinary research group, Technoscience Studies, fulfils the need for a 'home', a space for creating change. The group in itself contains a blurring of boundaries. The members of the group all have backgrounds from a number of academic disciplines, spanning all the 'traditional' faculties: engineering, humanities, natural science and social sciences, as well as different professional experiences both from within and outside of academia. The internal and disciplinary boundary transgressions within the group are made possible by what we usually call our joint "glue". We share and try to develop a common theoretical foundation in feminist epistemologies, such as it is suggested by for example Donna Haraway and her notions of situated knowledge and partial perspective (Haraway, 1991) as well as her figurations of the cyborg (Haraway, 1991) and diffraction (Haraway, 2000). We build an epistemological infrastructure different from the positivist one that dominates at our technical university. In trans/interdisciplinary work, a language with new metaphors and figurations is needed to help us work with connections that are born when categories get mixed and boundaries blurred. The projects within the group all circle around the notion of knowledge, understanding of knowledge and production of knowledge.[4] In our work, it is important for us to pose analytical questions to experience, to strive for a reflexive

[4] In the section Interventions below, we will describe the projects that we (the authors) are currently involved in.

mode of working, and to maintain conversations between different areas, research questions, theories, methodologies and so on, conversations that can expand our horizons and contexts. Our firm conviction is that our differences afford possibilities not only for being part of the future feminist research as a whole, but also for expanding the domains of IT research.

What boundaries outside of the group do we blur? The group, by its very existence within the technical faculty, challenges the boundaries of what is considered technology. As wee see it, IT as a field of knowledge and competence transgresses disciplines. However, our experience/interpretation is that there are forces within the technical domains of IT (such as for example computer science and similar disciplines) that strive towards disciplinary 'purity' and a narrow, technical definition, where inclusions and exclusions are created and maintained. In contrast to this, our understanding of IT within the group challenges this striving towards a technical view and aims at provoking the understanding of what IT is and can be. By asking questions and studying issues such as "What is IT?", "Who draws the boundaries for what IT is considered to be?" "Why are the boundaries drawn where they are?", "Who is excluded and who is included and why?", and not least "How could it be different?" we provoke the understandings of IT also within the technical faculty, aiming at blurring, dissolving or moving boundaries. This might well presuppose the kind of inter-, trans- and non-disciplinary background that the group represents.

Another boundary transgression comes from what we call experience-based research. Here, research perspectives as well as research questions differ from 'traditional' academic discipline-based research, thereby challenging boundaries for what can be considered (academic) research and knowledge production. This means that the research is 'impure'.

Our research interests and questions spring from professional experiences, either from within academia or from outside of academia, meaning that we do not start our research from an a priori academic disciplinary interest. We acknowledge the understanding that contemporary knowledge and technology is increasingly produced in distributed systems, where the boundaries between universities, industry and Government are transgressed (Gibbons et al, 1994, Nowotny et al, 2001). The definition of knowledge, imperative at western universities, has considered theoretical knowledge as the only form of knowledge. This narrowness excludes above all knowledge understood as 'practical intelligence', which is developed and used in concrete situations (see e. g. Göranzon, 1991). For us, including not only our own but others' experience-based practical knowledge in our conceptual and practical understanding is one of our epistemological foundations.

Our experiences have also provided us with the goal and driving force of our research: transformation. We are committed to change and transformation, a wish not only to understand and deconstruct, but also to suggest and create other possibilities and choices.

However, our research can be threatening: science traditionally strives towards increased order, simplicity, explanations. The type of research we are talking about here destabilises categories, it implies a movement from orderliness to questions and complexities.

Interventions

In this section, each of us three describe and discuss our own projects, and the experiences and questions they raise. We see these stories as examples of what we think feminist IT research could be about.

[Pirjo's story]

There is a continuum between identifying boundaries, transgressing them and working with intervention. No singular line should be drawn between the phases. On the contrary, they co-habit each other, they fight each other but in some strange way they also seem to be dependent on each other. Identifying boundaries often starts when you really do not know the environment you live and act in. Afterwards some of the boundaries start bothering you, the boundaries turn out to be limits and limitations. And then you start to think about changing things, and changing always involves intervention, at least if you want to participate in the change processes and not only be satisfied with being a (critical) observer.

Remembering my own nomadic personal history of crossing boundaries: geographical borders, language barriers and professional boundaries that strictly separated technology users and developers, many of my research questions are actually my own personal questions and headaches. I moved to the university when searching for a space for reflection and also believing that it is in academia that knowledge is produced. At the same moment when I myself crossed the boundary between different practices (from library work to research work), I also reproduced and accepted the boundary dividing the world into two categories: research producing knowledge and practical work producing results, services and products. I had moved inside and by doing that I had created an outside I could observe and write about. At the best moments, I could interpret and understand the world outside. I wanted and aimed to be pure in my academic knowledge production.

It was my research interviews with librarians that forced me to re-think the dividing lines between research and practical work, knowledge production, users and designers of information technology. To think seriously about my epistemological position, about situatedness and about research. I changed my perspective away from boundaries as dividing the world into two separate spaces, to considering a possibility to live and act beyond the boundaries and looking for a space in between. And also considering what kind of research I could do in this third space yearning "to move beyond simple dichotomies" (Suchman, 2002, p. 94). The personal became research, the research turned out to be political and the research turned out to be technology design or as Lucy Suchman states: "My own work moved through a series of projects that placed me increasingly within the worlds of professionalised technology produc-

tion. The impetus of this movement was at once practical, political, intellectual and personal." (Suchman, 2002, p. 94).

During 2003, I was able to take my thoughts, dreams, hopes and questions concerning the possibility of third-space research with me into a project in a small municipality in south-eastern Sweden. In the official project application, the project was defined as an e-democracy project focusing on spatial planning and concentrating on communication and interaction between the municipality and the citizens. The articulated aim of the project was to create a web site, where the new municipal comprehensive spatial plan could be presented and where the citizens could comment on the plan and discuss the spatial planning of the future in the specific municipality. For me, coming from feminist technoscience studies, the project was a challenging invitation to explore and contest my ideas about intervention research.

The first phase of third-space intervention research was connected to transgressing boundaries. In this specific project, transgressing worked in and through multi-perspective intertwined layers. First of all, the actors came from both the public sector (the municipality and the university) and the private sector (a software company and an advertising company). Second, the project was both a research and development project combining a variety of competences (practitioners from different municipal departments, researchers, software developers and web designers). And finally, for the research part, the project was a multidisciplinary[5] project (computer science, informatics, spatial planning and technoscience studies). To transgress in order to meet and talk, as easy and uncomplicated activities as they might seem to be, can at the same uncover the complexity of the transgression. This complexity was partly connected to in how many different ways the project members were occupied by time. Actually time should be written in the plural, because so many ongoing and non-solved and unfinished negotiations dealt with issues connected to deadlines, showing results, deliveries, concepts, terms and so on. Transgressing is necessary as a start, but is not a guarantee for a sustainable change if we do not take into account "the ability partially to translate knowledges among very different – powerful differentiated – communities…" (Haraway, 1991, p. 187).

The second phase of third-space intervention research dealt with the 'noise' caused by the researchers. As a researcher you always interrupt people, you take their time. You take place. Intervention can be a negative disturbance, even from the researcher's point of view. During this project, the research group actively participated in the project process. We arranged workshops and mock-ups[6]. We attended project meetings, not only as passive observers but as project members. In the short run, the workshops and the mock-ups were meant to give direct results and help in the project development.

[5] The notion of multidisciplinarity indicates the maintenance of the disciplinary boundaries

[6] […engougare hands-on experience, and thus support user involvement beyond the detached reflection that traditional system descriptions allow for; they are understandable; hence there is no confusion between the simulation and the "real thing", and everybody had the competence to modify them; they are inexpensive[…] they are fun to work with." (Bødker & Grønbæk & Kyng, 1993, p. 168)

To create space and time for the project participants to think concretely about the project and to work with the design. To blur the boundary between technology development and use. The project was thus a modest contribution to the larger intervention plan, namely to "…begin to replace the designer/user opposition – an opposition that closes off our possibilities for recognizing the subtle and profound differences that actually do divide us – with a rich, densely structured landscape of identities and working relations within which we might begin to move with some awareness and clarity regarding our own position." (Suchman, 2002, p. 92). At the same time, the activities also contributed to the striving towards stabilisation of the project, in the meaning designing and publishing the planned web site.

We (the members of the research group) talked with other participants in the project. Taking time and disturbing the normal order of the working hours. The project leader expressed the view that talking with the researchers "costs time. So maybe you cannot say that during the project you get anything directly back to the operative results".[7] In our discussions with the other project participants, we raised issues concerning the notions of democracy and citizenship. The conversations revealed that the project participants did not have similar harmonious ways of talking about and interpreting democracy and citizenship. The dialogue was open and seeking not, as we understood it, a final universal definition of the notions of democracy and citizenship central for the project, but a local and located interpretation. An interpretation also open to problematisations and frictions. The open negotiations that of course also could be interpreted as taking a lot of time and giving no direct results and being provocative, but which also could be understood as ways to localise and situate the essentially contested concepts in a place and time. The research interviews and project meetings were places were we could take words seriously. Or as Lucy Suchman puts it "The problems that interest us include the practicalities and politics involved in attempting to reconceptualize and restructure the ways in which work and technology design are done." (Suchman et al, 1999, p. 399). What reconceptualising meant in the project context was that during and through the huge amount of discussions, the goal was to come closer to committed concepts of communication, interaction, democracy and citizenship. The concepts have to be situated and accountable as well as other members of the project.[8]

Working towards committed concepts takes time and effort. But if the aim of our work was to situate information technology and make it sustainable and accountable, one of the goals of the feminist information technology research is to intervene by de-and re-conceptualising our language and experiences. Technology design – in spite of its materiality – is done through and in language. The other option, "this stance of design from nowhere is closely tied to the goal of constructing technical systems as commodities that can be stabilized and cut loose from the sites of their production long enough to be exported en masse to the sites of their use" (Suchman, 2002, p. 95),

[7] Interview with the project leader, 22 April 2003

[8] This discussion has been developed in co-operation with my colleague Annelie Ekelin at the Blekinge Institute of Technology

does not work if the aim is committed, situated and 'artfully integrated' (Suchman et al, 1999, p. 99) design. I would claim that discussions about democracy, citizenship and technology (also in relation to each other) in the long run were part of the positive stabilisation, which aimed to situate the often so rhetorical notion of e-democracy in this specific municipality. Intervention takes many forms of which talking could be one of the most powerful.

Much of the experience gained from the actual project reinforces the need for co-operation, co-involvement and trustful alliances. Alliances that include both people and technology. Alliances that tolerate discussions, tensions and slowness. Things do not often come quickly and easily. Interventions do not necessarily come in the shape of overwhelming and sudden change. Intervention might come in frictions, cracks, provocations and in small interferences as in the actual project.

What about my feminist research contribution to the project? It is not especially difficult to choose a sceptical approach to the numerous IT projects going on in Sweden. I could have chosen to read the project descriptions as hollow rhetoric and to consider the popular project form structuring the everyday change work as time-consuming, time-pressing and never-ending isolated islands. I could have chosen a gender equality approach to investigate if/how women are excluded in IT-projects. But, strongly inspired and challenged by Lucy Suchman and Donna Haraway, I chose to change the exclusion perspective to the perspective of inclusion. To include myself into co-operation with heterogeneous actors, to participate in the blurring of the boundaries of technology developers and users, to work with differences, dare to work slowly with language and to interfere in the 'belly of the beast' outside my safe space.

[Christina's story]
My undergraduate education was within engineering, and after that I have a long experience from within computer science (CS), primarily as a lecturer. After a number of years as a lecturer, I became interested and engaged in issues concerning women in CS. During the late 1990s, I worked on a number of projects targeting the situation for the (very few) female students in CS. My approach then – with very little, if any, knowledge of feminist theory – was un-arguably mainly that of liberal feminism (or the "women-into-technology" approach). The projects I worked on were no doubt attempts at interventions. Interventions into the male dominated culture of computing, interventions in order to support female students, and interventions into teaching (an experiment with gender segregated teaching, which was done in order to learn something from the female students so as to be able to make my teaching more gender inclusive). I would characterise these projects, these interventions, as targeting equality issues, and in fact, creating exclusions, instead of inclusions (singling out female students in the gender segregated teaching project for instance).

During my work on these projects, I gradually started questioning the common, "women-into-technology"-oriented approaches to the problems women face within computer science, realising that the "equality project" is not enough: "If emancipation means adapting to the standards, the measures, the values of a society that for centuries has been male-dominated, accepting unquestioningly the same material and symbolic values as the dominant group, then emancipation is not enough. […] Putting women in, allowing them a few odd seats in the previously segregated clubs, is not enough. What is needed is for the newcomers to be able and to be entitled to redefine the rules of the game so as to *make a difference* and make that difference felt concretely" (Braidotti, 1994, p. 242, original italics).

I developed an interest in exploring the complexity of the issues concerning "women and CS" and began to think around paradigms and knowledge within the discipline. My experiences led to my asking other questions, to an interest in the invisible and taken-for-granted: the discipline of computer science. I also became interested in feminist/gender research, and in 2000, I became a doctoral student in the Technoscience Studies group at Blekinge Institute of Technology.

The approach I take in my research is to move the focus from women/gender to the discipline of computer science itself. This means the question is raised to a more epistemological level, from "the woman question" towards "the science question" (Harding 1986), discussing the discipline, its paradigms and knowledge processes. For me, one way of doing feminist research that I believe can be fruitful is to research the epistemology (Trojer, 2002) and the representations, classifications etc. that are "built into" CS (e. g. Mörtberg, 1999, 2003; Crutzen & Gerrissen, 2000).

My research project is called "Computer Science and its Paradigmatic Basis – a Gender Research Study from Within". The project aims at developing new possible, broader understandings and interpretations of computer science and its practices. My interest focuses on knowledge creation and its processes within the discipline, including central paradigms and metaphors that influence these processes. These all relate to epistemology: What is considered knowledge within CS? How can knowledge be gained? About what is knowledge gained? Who can have knowledge? How are paradigms constructed and maintained? How could things be different?

So, my interest in gender/feminist research springs from very concrete experiences and the questions they raised, not because of an a priori academic disciplinary interest. My goal is to contribute to transformation within CS, but this time in a more long-term way, accepting that fundamental changes, if they are possible, take time.

Is it possible to integrate gender research results and issues into computer science education? Can feminist issues, perspectives and results be communicated to "mainstream" computer scientists? As part of my research project, I am attempting an 'intervention' into CS education. In this project, I am working with teachers of CS, where the participants get possibilities to deepen their knowledge about teaching situations and learning within computer science. This is accomplished through reflection on their own experience as teachers and with contributions from feminist research. A particular focus in the project is to discuss the participants' views of knowledge within CS, and particularly within programming, that they mediate to students, and to be able to relate these views to students' views and expectations.

I want to do what could be called feminist computer science research. What is this, does it exist, is it even possible? Is it possible to refuse categories and boundaries? I have the (impossible?) intention of being both a computer scientist and a feminist researcher. Norwegian informaticians[9] Tone Bratteteig and Guri Verne are sceptical about the possibilities of this, but they also challenge the existing dichotomies: "As female informaticians we are not doing women's studies. Movements towards doing feminist research might weaken our contact with and ability to do technological research (in contrast to the effect of social studies of technology for social scientists). We think it is of vital importance to stay an informatician, but with an interest in feminist research, refusing to resolve this dilemma by choosing one of these areas of research. By doing this, we do not accept the dichotomy between feminism and technology. The challenge is to learn to live with, and possibly harvest from, the contradictions and alleged paradoxes that arise." (Bratteteig & Verne, 1997, p. 70).

I have chosen to do feminist research, but hope to stay a lecturer in CS at the same time. For me, remaining a computer scientist is vital if I want to be able to communicate and work for change within CS. There are, happily, others who want the same, for example the UK-based grass-roots organisation Women in Computing (WiC): "…WiC attempts […] to raise the profile of feminist research in computing and to have it recognized as a proper concern for computing research." (Adam, 1998, p. 21).

In fact, I do not only make interventions into CS as a feminist researcher, I also make interventions as a computer scientist in feminist research. What does this mean? What is permitted among feminist researchers (such as ideas, opinions, writing style, language, etc.)? The attempt at being both computer scientist and feminist researcher leads to conflicts, not least internal, within myself. To cope with this, I think that the research environment is crucial: that it is acceptable to be both computer scientist and feminist IT researcher, and not to have to choose or to force one part to adapt to the other, but to enter into conversations. Thus, I find "impurity" and inter/trans-disciplinarity very important. The research within technoscience studies gives me space for experimenting and exploring, and opens possibilities for new approaches, making it possible for me to move between positions and see many different images and stories, thus approaching more complex understandings.

[Lena's story]
Feminist technoscience with emphasis on ICT is certainly motivated by transformation goals. The reasons for transformation are seen not only in the ongoing difficulties of achieving appropriate ICT system solutions especially in low-income countries, but also in the way we face contemporary processes of knowledge and technology development (Gibbons et al., 1994; Nowotny et al., 2001). The prerequisites for the latter are still to be met and urge for transformation not the least within academy and technical faculties (Etzkowitz & Leydesdorff, 1997). Feminist technoscience within technical faculties is a driving force for the transformation processes needed. (Björkman, 2002; Trojer 2002).

[9] "Informatics is the term for computer science departments in universities in Norway, indicating that the discipline is defined more broadly than in traditional computer science departments" (Bratteteig and Verne, 1997, p. 59).

With a background in natural science, technology and non-formal adult education, my professional life has been characterised by developing complex understandings about knowledge and research processes within technoscience and later with a special focus on ICT. Low-income countries and the postcolonial context are important for my work, which also includes techno- and research-political studies.

My own experiences within the motives for transformation are co-evolving with the identifications also made by others[10]. Developing appropriate and relevant technology (system) solutions is a complex and context-dependent issue and worked upon in many technology fields (see e. g. Rydhagen, 2002). As an illustration from the field of wireless telecommunication, a near technical revolution has been experienced in low-income countries like Tanzania by the implementation and use of mobile phones with prepay function. This kind of technology for direct communication between people seems to be appreciated as appropriate, relevant and affordable by a larger group of people than by the income-strong elite. The technology of cellular phones with prepay function has trickled down to the more income-weak masses. This implies a further elaboration of situated use and socio-technical development. A 55-year-old Tanzanian woman living in the poorer suburbs of Dar es Salaam explained[11] that she and her family could not afford a fixed-line telephone. However, having a second-hand mobile phone with prepay charging made it possible for her to develop her business ventures, necessary to supplement her scarcely paid teaching job, as well as to communicate regarding the well-being of her children, grandchildren and extended family members. Two motives for using this technology are brought out in her story. The possibility to reach the person you need to reach is higher with a mobile phone, in a country where the number of mobile-phone connections is three times that of fixed-line connections. This woman also emphasised the possibility of having control over the costs herself by means of the prepay function instead of a "salted" bill for the fixed-line telephone use. This is a sign of very low trust in public (and private) institutions in Tanzania – an understandable attitude under earlier and present circumstances.

Another experience is the transformation challenges that have to be taken and solved within an explicit mode 2 (Novotny et al., 2001)[12] project in an integrated regional developing process built on applied ICT. The region in question is Blekinge situated in the southeast of Sweden, a region that underwent tremendous structural changes during the 1990s from dependence on heavy industry and military service to a focus on ICT development in industry and the education system with a new technical university (Blekinge Institute of Technology). This experience implies recognitions of technoscientific and research politics deeply rooted in understandings of knowledge and technology production as processes that occur in distributed systems. In other words, knowledge creation today takes place on the boundaries between universities,

[10] The most recent reference I want to give is the numerous documents published within the WSIS (World Summit on Information Society) process, see www.genderwsis.org, www.itu.int/wsis.
[11] In an interview in September 2003
[12] Briefly, Mode 2 knowledge production is characterizsed as focusing on the context of application, transdisciplinarity and distributed processes.

companies (private sector) and other regional, national and international actors (public sector). These processes are no less prominent when located in the Blekinge region and in the research and development carried out at Blekinge Institute of Technology. The concept 'technoscience' is connected to this view of knowledge and technology production. The way in which technoscience is currently defined by for instance Donna Haraway implies attention to exciting issues related to boundaries and crossing the boundaries between science, technology, politics and society and between human beings and non-human beings as well as hybridisation processes between people and machines (cyborg theories).

During the last three years, a new university campus has been developing at Blekinge Institute of Technology. The campus in question is situated in a town in the western part of the county Blekinge. The university is an active, co-operating partner in a local innovation node[13] called NetPort.Karlshamn[14] with a vision to become a competence centre focusing on technology development within media, experience learning and game and intelligent logistics. The other two main partners are the municipality and trade & industry. One model explored for the processes taking place, when the three mentioned actors co-operate, has been the triple helix model whereby the three institutional bodies – university, industry and government – are increasingly working together (Johansen & Uhlin, 2001).

The triple helix model focuses mainly on the outer frame of the processes. The actual knowledge and development processes are more explicitly discussed within the concept of mode 2 (Nowotny et al., 2001). Researchers and teachers at Technoscience Studies have been deeply involved in the complex development process of a distributed knowledge and technology producing system like NetPort. This kind of practising intervention is an advanced mode 2 experience, also discussed with Michael Gibbons[15]. Emphasis has been put on building trust among the partners. We have tried to acknowledge accountability both concerning distrust among local people, companies and politicians as well as concerning challenges within spheres at our university that are uncomfortable with transformations that would change the traditional role of a "clean" university. Daily life consists of many difficult frictions, and we can ask ourselves why feminist ICT research is a driving force in these processes. To be very straightforward, the answer is to be found in the identified potentials of feminist ICT research listed below.

Discussion

We need many stories of feminist IT research. Our own specific stories based on our realities, practices and experiences remind us that we have to learn and act in worlds that are at the same time rough and smooth, full of frictions, contradictions and fluidities.

[13] A local organisation / system, within which several active partners collaborate to create innovations, economic and societal growth
[14] www.netport.karlshamn.se
[15] Interview 14 May 2003

We would like to end this article by suggesting a list of important potentials that can be found in feminist IT research:

- to expand the knowledge frames and practices for technology development in increasingly complex realities
- to open up preferential rights of interpretation in selections of standards, which are always reality producing activities
- to indicate alternative directions of IT applications
- to contribute with competences for situating knowledge and for context dependence concerning resource allocation from high-income to low-income countries
- to create explicit cultures within technology-related institutions at universities (phase out "the culture of no culture") and thereby make it clear that no research positions are innocent
- to develop epistemological infrastructures relevant to a society heavily dependent on research and technology
- to establish new arenas (agoras) for developing understandings of relations between research and politics
- to constitute a catalyst in negotiations between science and society
- to create driving forces for inter- and trans- disciplinary constellations.

These potentials can be seen as prerequisites for trying out transformations. But how to participate and initiate a movement that aims at trustworthy interventions and processes of change?

As the list of potentials suggests, the work cannot and ought not to be done by feminist IT researchers alone. When one of the fundamental bases for change is to look for and build up alliances, we have to learn to co-operate, also with people who do not always share our own epistemological and political concerns. We have to learn to ask new kinds of questions about alliances and collaboration, because the alliances and collaboration partners might be unexpected and strange in many ways. The questions are not necessarily complicated, indeed they are actually quite simple, as Donna Haraway, referring to the work of Helen Verran, writes: "How can people rooted in different knowledge practices "get together", especially when all-too-easy cultural relativism is not an option, either politically, epistemologically, or morally? How can general knowledge be nurtured in postcolonial worlds [our addition: in other worlds too] committed to taking difference seriously?" (Haraway, 2003, p. 7). Taking differences seriously means that there is a need to find a position to act, from which it is possible to respect differences but not to be satisfied with the relativist attitude of 'anything goes'. What is instead needed is a desire to get involved in respectful conversations without losing our own intervention goals based on feminist epistemologies.

Feminist research has for a long time made great efforts to understand and develop the ideas of otherness and difference, mostly connected to questioning the construction of women as a homogenous group. Our experiences tell us that this discussion is also extremely central and relevant when talking about information technology. What we

have to do is to investigate how the questions concerning differences and otherness need to be reformulated and situated in the context of information technology. We have experienced that the differences present in IT practices often show up in tensions concerning issues of expertise, participation, knowledge production, implementation, as well as political and societal development. The world of information technology, as well as all other worlds, consists, of "power differentiated communities". (Haraway, 1991, p. 187). This dirtiness is at the same time an essential part of the different actors' (in the IT world) collected dreams of "how things might be different" (Haraway, 1991, p. 93). There is no room for innocence, but at the same time there is no place for never-ending conflicts either. But there should be room for "an earthwide network of connections, including the ability partially to translate knowledges among very different…communities." (Haraway, 1991, p. 187). What we want to show by telling about our experiences is that this translation work, where there are no readymade models and methods, is at the same time a possible and a very difficult task. And we have no idealistic hopes that the work can be done immediately, extensively and without collisions.

Information technology is so tightly interwoven within our lives that stepping outside, only analysing and criticising is not a position available for feminist IT research. On the contrary, dirtiness and impure places and actions are the only option because we have to participate in situated, concrete practices: "Answers to these questions can only be put together in emergent practices; i. e., in vulnerable on-the-ground work that cobbles together non-harmonious agencies and ways of living that are accountable both to their disparate inherited histories and to their barely possible but absolutely necessary joint futures." (Haraway, 2003, p. 7).

This is our story. What other stories are out there? Stories not yet told, situated in people's lives?

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Part B
– Stories of Information Technology

To the Reader

In the following chapters we move to practices of information technology. Stories of a municipal web developer, a library project, librarians involved in projects, an e-democracy project and web technology engaged in shaping citizenship, create an embroidered tapestry where people, politics and technology get intertwined.

I have explored spaces where negotiations of border transgressions take place and where issues of technology and society mingle. They are also spaces where I feel comfortable, because they are in many ways similar to those spaces from which I have brought my own experiences: public sector, libraries, small-scale development projects, practices where the user/designer boundary is not that clear and fixed. Feeling that I myself come from spaces and practices similar to my research sites has provided both a physical and epistemological access to the practices explored.

Chapter 1 'Discourses and Cracks – A Case Study of Information Technology and Writing Women in a Regional Context' is about a project where questions concerning the discourses of information society, with a special focus on the notion of citizenship, were discussed and where global and national politics were translated to local and situated practices.

Chapter 2 'Translating and Negotiating Information Technology' consists of two main parts. The first one is about a regional library project classified as an information technology project. The analysis of the project is based on the classical ANT-approach which invited the study of the heterogeneous and negotiable shaping of IT. The second part is about three librarians involved in projects developing web based services. The analysis is inspired by the later development of ANT in order to include also the more invisible relations and negotiations in the shaping of IT.

Chapter 3 'Negotiating Information Technology: Politics and Practices of The Public Sector Web Production' is about a municipal web developer through whom the creation of sociotechnical relations of everyday information technology practices is analysed.

In the chapter 4 'Making e-Government Happen – Everyday Co-Development of Services, Citizenship and Technology' we meet the same web developer as in chapter 3 but now his everyday practices are connected to an expanded and wider circuit of co-constructors of information technology. The text is a co-production of a multidisciplinary research group, aiming from a diversity of perspectives to describe, analyse and problematise the connections present and needed in building up practices where technology and society collaborate.

Chapter 5 'Citizenship at the Crossroads of Multiple Layers of Sociotechnical Relations' enrols technology as an active actor in the construction of citizenship in the information technology context in Sweden. The perspective that emphasises the active

agency of non-humans both enhances and challenges the Scandinavian approach of systems development by suggesting a direction of a cyborgian approach towards systems development.

Chapter 6 'Between Stability and Instability – a Project about e-Democracy' once more takes its point of departure from a small-scale project that had as its goal the development of e-democracy in a municipal context. In the text the focus is on the stabilisation processes in shaping both technology ('e') and democracy during the project. In the text I also discuss what kind of space the space in between (the hyphen in e-democracy) is and raise the question if the integration of technology and democracy is possible as a whole.

All stories are specific and unique but also connected. We meet a diversity of actors in the world of information technology: political texts, people, computers, money. We meet relational information technology that gets its meaning in negotiations with all their critical points. Time is the end of the 1990s and the beginning of the new millennium, 2000. Years when information technology occupied the western world and created its own fuzzy discourse. Years when information technology stole the biggest newspaper headlines and years when information technology became a mundane everyday part of our work practices. Years when we learned to live in heterogeneous worlds.

[Translations from Swedish to English are made by the author.]

Chapter 1. Discourses and Cracks – A Case Study of Information Technology and Writing Women in a Regional Context[1]

Introduction

In the Finnish story known as "Granen" – The Christmas Tree – by Tove Jansson (Jansson, 1986) we meet the Moomins as they wake up from hibernation. "Mummy, wake up", the Moomintroll says in a frightened voice. "Something terrible has happened. It's called Christmas". "What do you mean?" says the mother, as she pokes out her small nose. "I don't really know", says her son. "But everything's upside down, somebody's lost, and they're all running round like mad men". The family looks on Christmas as an evil monster. It's all a question of being properly prepared. "It seems that you need a Christmas tree", says the father in a contemplative voice. "I don't understand anything". Everybody else seems to know about Christmas except the Moomins. "What do you do with a Christmas tree"? The Moomin father, who is normally quick to act, is cautious. "Here is the tree. If we only knew what it should be used for. Gafsan says that it has to be decorated. Do you know how to decorate a tree"? After receiving advice from friends and neighbours, they begin to understand that there are rules about how to decorate a tree. "If you are supposed to make a tree look as beautiful as possible you're surely not supposed to hide yourself in it to protect yourself from danger; it must be a way of warding off danger". They start to decorate the tree in their own special way using shells and pearl necklaces. At the top, they place a red silk bow instead of a star. "Goodness gracious me", says the hemule's aunt. "But you've always been a bit strange". 'I think there ought to be a large star at the top", says the little mite's uncle. "Do you think so"? says the little mite. Is there such a big difference between the mere idea, and reality"?

In the above story we meet a family in a transitional world which is about to be invaded by something new and strange. What was so natural for others seems to threaten their secure existence. There also seems to be some kind of official view of how Christmas should be celebrated. The family tries to work out what the right thing to do is, but soon finds that there is room for personal interpretation and application. By finding out what is expected, they can produce their own picture of Christmas, master danger and gradually decide for themselves how to celebrate occasion.

What on earth does the Christmas tree in the Moomin valley have to do with a discussion about information technology one might ask? Tove Jansson's story can be read on another level if it is seen as a metaphor for the introduction of information technology into society. If we regard the helpful friends' interpretation of how the tree should be decorated as the official version, or representative of the prevailing discussion of how

[1] By Ekelin, Annelie & Elovaara, Pirjo. A shorter version published in Balka, E. & Smith, R. (Eds.), Women, Work and Computerization: Charting a Course to the Future: IFIP TC9 WG 9.1 Seventh International Conference on Women, Work and Computerization June 8-11, 2000, Vancouver, British Columbia, Canada, (pp. 199-207). Boston & Dordrecht & London, 2000, Kluwer Academic Publishers.

B.1 Christmas should be celebrated, we see that the text contains a number of questions which are central to the present essay. Who decides that it is necessary to have a tree, and who dictates how it should be decorated? What is the consequence of not having a tree, or of decorating it as one pleases? What happens if we regard information technology discursively, just as the Moomin family views Christmas celebrations and the Christmas tree?

Let's start by explaining the concept of discourse. The latter may be defined as "regulated, methodically organised discussion which dictates what may be said or done, and what may not be said or done" (Johansson & Nissen & Sturesson, 1998, p. 39). A discourse defines both values and the world. "The dominating, prevailing and predominant [discourses] are created by what is taken for granted and regarded as normal" (Mörtberg 1997, p. 38). Discourses are born and brought to life in public texts and speeches. In other words, language and words are both the source and channel of a discourse which describes our way of relating to a phenomena or event. Discourse also shapes, and is shaped by, different practices which presuppose actors and action. "Wittgenstein sees a concept as a collection of activities which follows certain rules: it is how the concept is used which determines its meaning. It is our actions or our praxis which shows most deeply how we have understood something" (Göranzon, 1990, p. 134). The dominant discourse as Mörtberg defines it is not hermetically sealed, however. There are always "cracks, or inadequacies" (Fahlgren, 1998, p. 25). Wherever there is power, there is counter power (Järvinen, 1998, p. 52). Alongside the dominant discourse grow alternative discourses and counter discourses.

The predominant IT discourse

If discourses are born and live in public texts and speech we can define such discourses on two levels: by analysing customary terms and concepts, and official policy documents.

A basic question is, "does it make any difference if we speak about information technology or use the term IT"? The neutral reading of the combination of letters comprising IT can be understood as an abbreviation of the words Information Technology. This is no longer a satisfactory reading, however, since IT has been transformed into a contemporary icon and represents many more values than the linguistic become a symbol of ellipsis suggests. IT suggests, for example, abstract attributes, and it has certain life style connotations. The abbreviation has expectations and norms for living. IT, in other words, belongs to also modernity, and is suggestive of numerous positive values, everyone, and the term successfully disguises the strong technical aspects. IT raises hopes and expectations for the future. Who doesn't want to move to a city flat with IT facilities? What is the future of children who are not able to share in the benefits of modern IT teaching methods? Who is willing to give up top quality IT-based health care? IT gives its users, owners, and exploiters a bonus, a right to become part of its world, and to make use of its facilities.

IT may also be seen as a political and practical discourse which is in part shaped by the repetition of an exalted rhetoric. This repetitive discursive model can be distinguished in global, regional and local contexts.

"Internet is for everyone" was the theme of an international conference organised by the worldwide organisation ISOC (Internet Society Organisation; http://www.isoc.org). This same phrase was also used by Vinton Cerf, a member of the ISOC board, in a speech made on 7 April 1999 at an international conference on "Computers, Freedom and Privacy". But to achieve this goal, Vinton Cerf argues, the equipment and connection to the Internet must be cheaper, the technology must be more accessible, and governments must agree to regulate its use by levying restrictions and prohibitions. Let us all give ourselves up to the task of simplifying the Internet interface and training all those interested in using it. This was Vinton Cerf's challenge to the conference delegates. Internet can be used to further the development of democracy as well as commerce. The "technological evolution" must continue if we are all to move towards a future without boundaries (Cerf, 1999).

In the preface to "How should people in Blekinge use IT" Svante Ingemarsson, who at the time of publication was responsible for the programme of the IT Blekinge association, wrote that "we are entering a new society. Information technology will be used more and more. Even now the very basis of everyday life is undergoing change [. . .] We know what we want to achieve: a higher quality of life, more jobs, democratic power for everyone, equality between men and women, the same preconditions for town and country, and more opportunities for the disabled" (Hur ska vi i Blekinge använda IT?, 1996).

In another text which presents IT Blekinge's view of the development of IT, Svante Ingemarsson describes the future of Blekinge in terms of the central role of technology in society, "for our own sakes perhaps the major driving force for all of us in Blekinge should be to welcome the new society with open arms – both technically and on a human level, with our eyes wide open and without fear. IT (whatever we mean by that) is not a solution to all our questions and problems, but it is a major force which affects us all – to a greater or lesser extent – both at work and in our everyday lives. It's just as well if we accept this, learn, and let technology be one of our active tools as we shape the future together. It's better than letting it jump on us from behind!" (Ingemarsson). This text conjures up a picture of a world which is undergoing revolutionary change. IT is both a catalyst and a tool in this process. It is the entire population, "all of us together", who are invited to join a new society. This invitation does not allow a negative response, however, and does not allow us to keep the process at a distance. The transformation is inescapable, and affects all our lives. The future is positive: "better quality of life, more jobs, democratic power, equality . . ." in all respects. So who'd want to miss the trip? It should be noted that there's no opportunity to take part in the planning and decision-making processes. Citizens are given their portion of ready-made services and products, all of which have been developed and produced somewhere else, and at someone else's initiative.

B.1

Of all the municipal councils in Blekinge, Ronneby was one of the first to invest in IT: "Ronneby in the year 2003, an IT society", is the name of an umbrella project started by the council in 1993. The aim of the project is to co-ordinate, initiate and stimulate IT applications. "The project will give the inhabitants of Ronneby ample access to information technology. IT will be a democratic right. Dialogue and participation are key words. Renewal, initiative and variety are furthered. Small local spear head projects are being developed alongside major investments. Ronneby is a test bench for full-scale IT investments (Ronneby kommun(b), (c)). The goal of the 2003 project is, among other things, to make IT a democratic right, to bring to life the information society, and to entice new companies to the area.

"The 2003 project aimed from the start to give the general public the opportunity when visiting the library of encountering the new technology. User-friendly software was developed, and the personnel as well as the general public attended courses [. . .] everybody will be given the practical opportunity of finding out what the information society means without having to make any financial commitment. During the last year, channels have been opened up on the web and e-mail introduced, thereby increasing communication between citizens and politicians/civil servants" (Ronneby kommun (b), (c)).

A common thread in the above-quoted texts is the view that "IT is for everyone". This is the self-evident official device for our information society, where the Internet embodies accessibility, and is regarded as a democratic right. "The information society changes business and commerce, and democracy. Knowledge, which was once the privilege of the few, is open to everyone. Regional imbalances can be counteracted, productivity increased and new companies built. Information Technology must be a means of increasing freedom, participation and justice", in the words of the Prime Minister of Sweden, Göran Persson, used at the opening of the parliamentary session in September 1999 (Persson, 1999). The development of the hard- and software, and the building of the technological infrastructure presuppose speed, and the ability to act and make decisions. "And even if different investments are made here and there, daring and determination are missing. There are more contributions than fast data connections, unfortunately" (Bildt, 1998) says Carl Bildt, ex-chairman of the Swedish conservatives. A central feature is also the provision of instrumental training in the form of IT projects. These often resemble a literacy campaign for the general public. "But it is at least as important that everybody has the knowledge and self-confidence to make use of the technology. It is our belief that a digital right of access like that which applies to the Swedish countryside is needed" (Andersson & Daléus), was the comment of Centre Party politicians Lennart Daléus and Elving Andersson at the party congress in 1999. The question is, does one really become more involved as a citizen by taking part in projects and courses the main aim of which, despite the prefix IT, is to teach basic computer skills? Can one really change the world by teaching people how to use Microsoft Word?

These visionary words (IT for everyone, accessibility, democracy, development and change) can be compared to mystical formulas which are constantly repeated in different official contexts where strategies and discourses involving the Internet and information technology are formulated and applied; words which guarantee the free entry of every citizen to the magical spheres of technology, and confirm the importance of technology in stimulating democratic and social processes and the renewal of society alongside economic development and growth. "Acceptable statements include: IT has developed fast, and will continue to do so; IT is the basis of the information society which has succeeded industrial society; IT creates new jobs; we must keep up and learn how to use IT; IT will lead to decentralisation and increased democracy; IT leads to globalisation, and a reduction in the power of nation-states" (Johansson & Nissen & Sturesson, 1998, pp. 43-44).

The above-quoted official texts constitute the dominant discourse, and fall within the limits of what is permissible. Technology is regarded as a self-evident driving force, and is both the end as well as the means. This view of the independent power of technology may also be found in "other discussions about society in the future, discussions which reflect a technological optimism; technology is seen as a tool and a driving force to create growth, job opportunities and strengthen the country's competitiveness" (Mörtberg, 1997b, p. 25). Characteristic of the belief in autonomous technological development is that it automatically furthers democratic development. IT is thus often presented in a well-camouflaged "social suit". In the same way, modern society demands a properly tailored "technology suit". The most suitable terms for the predominant IT discourse are thus "democratic/technological" contra "technological/democratic discourse".

Democracy and Citizenship

Is it really this simple? Does IT development automatically lead to "us" becoming more actively involved in social developments. Does increased accessibility and the use of IT increase people's interest and involvement in democratic questions? We must start by asking the basic question, "what is democracy"? By tradition, democracy implies participation, and certain rights. These rights consist in turn of different types of citizenship: individual citizenship (the right to freedom of expression); political citizenship (the right to vote); and social citizenship (various social benefits such as child allowance) (Voet, 1993, pp. 15-16). This is what is normally dubbed "universal citizenship". Everyone is assumed to have the same rights and responsibilities. It is perhaps important to remind ourselves that when democracy was born, it was based on the exclusion of women and other peripheral social groups. Politics was reserved for the ruling class in ancient Greece. Women, children and slaves were excluded (Kahlert, 1997, p. 26). Ruth Lister writes as follows about universal democracy: "a concept, originally predicated on the very exclusion of women" (Lister, 1997, p. 195). If power is explained in terms of domination, the dominant group is able to exclude both "outsiders" and subordinate groups from the system, and in this way successfully thwart full-blown citizenship (Lister, 1997, p. 204). The definition and application of democracy is based on a dichotomy or dualism between the public and the private (Lister, 1997, p. 198). The arena of citizenship is the public; in practice this has meant the political arena. The majority of those acting in this arena are, as in the past, men. The private arenas include health care and care of the young and elderly, where it is

women who have always been, (and indeed still are), the most active (Lister, 1997, p. 198). Power is exercised on both sides of the division between the public and the private. In an IT context, for example, it can regulate access to IT tools, and assume the right of interpretation in the process of defining knowledge and expertise.

As we have already pointed out, IT is seen as an important part of the future development of democracy. It is thus important to establish the official relationship between IT and democracy. We can take a look at an official investigation about electronic and digital democracy (Olsson, 1999). Anders R. Olsson, author of the report, presents three hypothetical models, which have been applied in the establishment of electronic democracy:

Model 1: classic parliamentary government with IT support (Olsson, 1999, pp. 55-56)
Model 2: grass roots power, "democratisation starts at local level. Inhabitants of a small authority or region can use IT to organise the spread of information, discussions and decisions, and in this way become more active" (Olsson, 1999, pp. 62-63)
Model 3: well thought-out reform: "a reform from above i.e. high-level political decisions" (Olsson, 1999, p. 65)

As Olsson himself points out, however, "to start a discussion on electronic democracy with technical models is clearly putting the cart before the horse. It's important to know what you are trying to achieve with democracy before trying to make it electronic" (Olsson, 1999, p. 103). The real issue becomes instead, "how do we get those citizens who are not interested in politics to become active and participate"? (Olsson, 1999, p. 39). Olsson's ideas are based on the fundamental principle that many citizens are neither interested nor involved. This assumption is never questioned in the investigation. This lack of involvement, which is axiomatic, can, according to Olsson, be rectified by improving the spread of information. "The starting point for ideas about electronic democracy is that the democratic process can be described as a course of information treatment. Participators in the process gather knowledge and opinions, exchange these with one another, and ultimately make their views known by voting" (Olsson, 1999, p. 26).

The view expressed in the investigation suggests that information comes from somewhere (above), and is waiting to be collected. Can we read between the lines that the author is referring to official information? Shouldn't a more basic question be asked: "why is there such a lack of interest and involvement"? One possibility is that it is a kind of protest, or a lack of subjective room for action (the ability to act and strength of initiative). The investigation should have addressed the obvious question, "is silence necessarily a sign of lack of interest"?

All Citizens – Except Women?

In official texts the category "all" appears to be unambiguous. It is time, however, to investigate who is actually included in this category. Despite the strategy declared by the main actors of involving "everyone" in the regional development of IT, it has been demonstrated by an investigation by two Lund University researchers carried out in 1998 on behalf of the county's municipal authorities, the County Government Board, the County Labour Board, County Council and the University of Karlskrona/Ronneby, that women feel that they are excluded from local IT activities in Blekinge. The authors of the report write in their summary that "the dominance of the armed forces and major manufacturing companies has created a cultural tradition in which women are to a large extent invisible. It is almost exclusively men who dominate commerce and politics. And only men are appointed as directors in the public and private sectors" (Andersson & Rosenqvist, 1998, p. 40). The report continues , "most of these women [the approximately 800 women taking part in the study] are pessimistic about their ability to exercise any influence in the following areas; housing, social services, leisure, communications, work and training. This feeling of lack of influence is, we believe, due to the fact that women do not feel themselves part of, or an asset in, regional development" (Andersson & Rosenqvist, 1998, p. 42).

In western culture we often speak about democratic principles, which means, among other things, that we elect municipal councillors, municipal politicians and committees every third or fourth year. Can't we find any women in these bodies? The answer is both "yes" and "no". In Ronneby Municipal Council, approximately 40 % are females. In the local government administration, 27 % are women. Not one of the committee chair people is female (Ronneby kommun (a)). This picture is by no means unique for Blekinge, or indeed for Sweden as a whole. It is a general phenomenon affecting present and future global IT development. Our belief is that the women taking part in the investigation regard themselves – and are seen by others to be – outsiders, strangers to political life. Olsson sees this estrangement as a reflection of lack of interest and involvement. He explains the silence of citizens in the following way: "in personal meetings people can feel inhibited for all sorts of reasons – common shyness, emotional disturbance or stammering, to name but a few – and they would therefore think and express themselves better in a purely virtual, text-based environment" (Olsson, 1999, p. 127). The question should instead be, "why do citizens choose to be silent in public affairs"? Who is silent? What happens in a private context – is this a possible place for democracy? Is there any connection between the subjective and the objective space for action, i.e. our ability and willingness to take part in investments in social information and transform these to personal interpretations and actions? How and where is our "own voice" to be heard? Is it permitted to be silent, or must we be forced to become part of the public arena in order to activate our citizenship?

Alternative Discourses and Cracks

Despite the fact that earlier in the present paper we concentrated on the crystallisation of the predominant IT discourse, and found that the definition is closed and definitive at grass roots level, it is essential to remind ourselves that IT is a process, and a social construction. By regarding IT as a process and a construction one is challenged, and it becomes possible to search for cracks in the prevailing view. There is nothing deterministic about IT, since a social construction requires constructors. The predominant discourse also enables resistance, and the creation of alternative discourses. What happens when the IT mystical formula is translated into concrete action and

practice? What will be the result of slowing down, and putting reflection before the fast absorption of knowledge, or technological development?

We will now leave the outside perspective with which we have been able to draw an IT map based on theoretical, political and real preconditions. Instead, we shall place ourselves in the position of the subject of the IT discourse. A concrete opportunity to stimulate an alternative understanding of IT appeared when we were given the opportunity to work within the framework of an international IT project, the basic principles of which were identical to those already identified by us as the predominant values of the IT discourse. We chose, however, to analyse and take advantage of these values from feminist perspectives, the aim being to allow the discourse to be interpreted openly and pragmatically. This interpretation prepared the ground for a project based on a complex understanding of the following formulated discursive values: democracy, accessibility, change and development.

The DIALOGUE Project

The EU DIALOGUE project started in 1998 and ran to spring 1999. It involved Bologne, Ronneby and Lewisham (London) (Dialogue). The project was characterised by a clearly pronounced democratic profile, and aimed at developing the use of IT as a means of furthering democracy and methodological development. This is where the "crack" showed itself, in the opportunity to re-interpret both the IT and democratic discourse. The target group comprised individuals and groups otherwise in danger of falling outside developments e.g. women with little training and education, unemployed people, immigrants and the elderly. The latter description of the target group can lead to the assumption that the project constituted an aid programme for the underpriviliged, with the aim of levelling out differences in technological expertise among different groups of citizens. It also provided us with a justification, however, to work with an all-female group, thereby successfully avoiding the trap of false universality. Our project was supported by a text by Linda Alcoff, who writes, "[understand the concept of woman as] a subjectivity that is constructed through a continuous process, an ongoing constant renewal based on an interaction with the world, which she defines as experience, and this subjectivity is not produced by the external ideas, values or material causes, but by one's personal subjective engagement in the practices, discourses and institutions that lend own context of time and space" (Alcoff, 1988, p. 424). Women as a group share experiences in a specific historical place and time, and these experiences in turn shape a common framework and basis for activity and practice. It also leaves space, however, for women as subjects, situated and positioned in a wide variety of realities.

The WWN Project

The Women Writing on the Net (WWN) project began as a sub-project within the framework of DIALOGUE. The overall aims of the project were to further grass roots democracy by working with "empowerment", a term based on the popular '70s movement which aimed to introduce conscience-raising activities, to conquer and re-define the public arena, to stop the drawing up of boundaries or dualism between public/private or expert/non-expert and to build virtual communities.

The goal in working with "empowerment" was to encourage women to re-define themselves: to become and act as insiders in IT contexts, as well as in society as a whole. By using their own experience as a source of knowledge, women were able to renew the value and strength of these experiences. Our vision was to weave together the overall goals with the practical working method and the individual elements of the project. The latter thus assumed an overall view and a focusing on the exchange between aims, working method and individual project elements.

Two groups, consisting of women with greater or lesser experience of using computers, met every Tuesday for a year to discuss, write and learn how to use the new technology. Basic introductions to word processing, creation of home pages, picture editing in the web environment and searching for information were included in the project. Communication using e-mail, chatting and electronic discussions took place between project participants in Bologne and Lewisham.

The project was also responsible for bringing about a physical meeting between Swedish women and immigrant women. This was also a golden opportunity for immigrant women to practise their Swedish, and to learn about Swedish customs and traditions, cultural phenomena and politics. They mastered codes and invisible passwords. The Swedish women were given an insight into the experiences and culture of the immigrant women.

An essential part of the project was also the methodological development, which focused on the learning process in a specific social context. The aim was to give time and space to writing, discussions and reflection and to combine this with IT training as a means of integrating action and reflection. This was achieved using a method which stimulated personal development in, and throughout the group. We consciously worked to break down the fixed barriers between expert/non-expert, participant/project manager. Everyday personal experience and reflection were used as the main sources of knowledge. Writing functioned as a means of articulating the individual's voice as well as comprehending the process. Individual elements such as developing skills in using IT aids, and reinforcing the powers of personal expression by means of written exercises – both group and individual – were also important elements in the greater whole.

Seymour Papert, professor of mathematics, maintains that one should see "knowledge as something which grows as part of a process of curiosity, dialogue and involvement" (Papert, 1994, p. 78). Learning which is linked to experience and previous knowledge is the most fruitful, says Papert. He also wishes to raise the status of concrete thinking, which society regards as inferior to abstract thinking. He believes that an abstract principle should instead be seen as an aid to concrete thinking, and not as a solution in its own right. As an example, Papert cites how one learns mathematics in the kitchen, and botany by first learning to distinguish between different kinds of plants and then studying Latin (Papert, 1994, p. 124). Seymour Papert and Sherry Turkle advocate the use of bricolage as a fruitful method of producing computer training closely linked to reality. The term originates from the anthropologist Claude Levi-Strauss's theories

about western analytical, abstract thinking as opposed to the concrete sciences and their many associations practised in many non-western countries. The theory was originally presented in the book 'The Savage Mind'. It seems to have undergone a new renaissance in the computer age. Bricolage can be described as a learning situation in which the learner is allowed to improvise and take advantage of whatever is easily accessible. Bricolage can also be seen as a method for producing, repairing and improving mental constructions. (Papert, 1994, p. 124). Sherry Turkle describes the method as follows: "the tribal herbalist, for example, does not proceed by abstraction, but by thinking through problems using the materials at hand. [. . .] problem-solvers who do not proceed from top-down design but by arranging and rearranging a set of well-known materials can be said to be practicing bricolage. They tend to try one thing, step back, reconsider, and try another" (Turkle, 1997, p. 51).

The starting point of the project was that we would all learn together, by co-operating with and meeting one another, by sharing our knowledge and experience, and by interpreting and formulating – on a mutual as well as an individual basis – our understanding in words and thoughts as well as in writing. Those women who had more training in using the Internet and different computer programmes helped the beginners. This reinforced the group identity as well as the self-confidence of each individual. In teaching others you also learn yourself. Above all, you learn by doing.

Writing as Aim, Tool and Method

Writing during the project played an important role on several different levels simultaneously. One of the central goals was to further grass roots democracy, to conquer and re-define the public arena. If one sees speaking as a political act and political tool, communication between people and the development of the individual voice is fundamental to the development of democracy (Kahlert, 1997, p. 19). Since today we cannot talk about talking in IT contexts, it is still writing and the ability to express oneself verbally which is the basis of all communication and interaction on the Internet. These are IT's main arenas. As one of our goals was to further electronic grass roots democracy as defined in Olsson's second model (Olsson, 1999, pp. 62-63), we considered it essential that the individual be able to rely on his or her own voice, and we stressed the importance of the written word as well as the potential of IT as a voice amplifier and megaphone (See, e.g. McKay, 1998, p. 187).

The aim of writing was thus not solely to provide material for home pages. It was also used as a means of creating a unified whole, of providing a context as well as a tool for different elements of the project. Writing was also a way of creating a dialogue and stimulating reflection as well as personal development in, and throughout the group. It also worked as an aid to explaining abstract structures and complicated computer terminology e.g. when the group illustrated a link and how it works on a home page by using a written exercise. The participants wrote down their spontaneous associations to a particular word or a sentence on small pieces of paper. Once these had been collected in and put on a noticeboard, the connections between the texts were drawn in with the aid of lines. A number of possible crossroads were gradually identified, and

the result was the creation of a network in concrete form. We could then follow up the exercise with a discussion about how links work on a home page.

The Home

A vitally important part of making the results of the women's work visible was to initiate the creation of virtual fellowships and communities. The first stage in this process was to start creating the project's web pages, where the participants were given the opportunity to publish their work and texts: http://www.ronneby.se/dialogue/Ksn/wwn.htm. The web site took the form of a four-roomed house. This graphical design was inspired by Virginia Woolf's thoughts in the classic essay "A Room of One's Own". In this essay, Woolf describes the early twentieth century female author's right to a physical and social space in which to produce her work (Woolf, 1958, p. 11). Times may well have changed but the woman's need of a space of her own, where she can think and feel at leisure, and where personal expression is permitted to grow and develop, is every bit as important today. Internet can be seen as a modern public arena. This can be put to private use, and on one's own conditions, by creating a symbolical and real room on the Internet. The latter can be furnished with one's own thoughts, visions and dreams. It can also be seen as a way of re-conquering the symbol of "the home", which throughout history has closed in the woman in the private sphere, and shut her out of the public one. This re-conquering and re-definition of the home is particularly significant given that the latter is closely associated with the place and task of woman in western society. It is always present, accessible but invisible (Star, 1996, pp. 31-34). Our "home" on the Internet opens up new, exciting worlds, in the private as well as the public sectors.

Individual, Collective and Public Writing

The rooms represent different aspects of writing which have always run parallel at different levels: individual writing, collective and public. The four rooms consist of the Portrait Gallery, the Individual's Own Room (containing poems and stories), our Pantry (with recipes and gastronomic memories) and the Discussion Room (a forum for discussions). The categories are neither clear-cut nor separate, however. Everything is woven together and intermingled. In the Discussion Room, for example, a wide range of topics is discussed, from the existence or otherwise of rhyme forms, funny stories about the wisdom of children, to the problem of unemployment, and anger at the bombing of Kosovo. In the Individual's Own Room, where it is possible among other things to read personal childhood memories, there is a description of a family party described through the eyes of a child, and an authentic description of class differences in modern Sweden. Everything is presented in the public sphere, i.e. on the Internet. In this way, the division or dichotomy between private/public is dissolved in a very obvious way. These living examples of events experienced, feelings and thoughts can be regarded as an embodiment of history and the present, and are as such a clear reminder of the fact that a dichotomy between the public and the private is both artificial and irrelevant.

Making Yourself Visible in Writing

The texts of the participants, which were by and large autobiographical, literary or simple, were based on experience, a form of writing often associated with women. The autobiographical contributions of our groups cover a wide range of subjects e.g. childhood memories to thoughts about working as an assistant to a handicapped boy. Some women described their personal relations to computers. One wrote about her fear of getting old and not having anyone to care for her. One diabetic described in poetic form her mixed feelings about food and cooking. Describing yourself with the aid of metaphors is also a way of reflecting on the creation of individual identity, which consists of many different parts. One of the women wrote in her sub-evaluation, "writing assignments such as 'Describe yourself as a house' or 'Home – homeless' has given me a new insight into myself, who I am, what my life is like and why my life is as it is". On another level, such writing tasks can expose the traditional, historical and cultural expectations and demands which influence the creation of female identity.

Writing Together

Our Pantry, or the virtual cookery book on the home page of the project, is an example of writing together, the aim of which is to draw out invisible knowledge and experience. To present the experience of many years of cooking e.g. how potato dumpling mixture should be squeezed to give it the right consistency, is an example of invisible knowledge which deserves attention. Another example of joint writing within the group is the latter's collective effort to formulate questions for local politicians. These questions were to be included in a debate on the local municipal authority home page. A third example is where the participants wrote an informal letter to Swedish members of the EU Parliament to inform them about our project, and to investigate the possibility of a financial contribution to a study trip to Brussels.

Judging by the evaluations, the experience of being able to write – both as an individual as a member of a group –, of ultimately being able to transform material for a home page, discuss writing in general and produce personal texts to be read out loud to the group, has been the most important result of the project as far as the participants are concerned. Being able to share with others one's thoughts and reflections about different texts created new perspectives, and encouraged the writer to think again and revise her text. In some cases, it might even have led to a re-interpretation of the personal experiences at the heart of the text.

Concluding discussion

As a way of rounding off, let us just join together the two main actors, the Discourse and the WWN project, in an unusual final discussion and summary.

"The WWN Project Meets the Discourse"

Scene: a typical, somewhat run-down conference room with the usual conference room furnishings (a large oval table, 16 chairs with metal legs, white board and overhead projector).

The roles: the Discourse and Women writing on the network, the (WWN) project.

Discourse says:

– IT is important for democracy.

The WWN project says:

– What democracy? Do you mean grass roots democracy or just the good old parliamentary sort that's going to be given a new lease of life with the aid of IT?

Discourse answers:

– Hmmmm . . . All citizens will be able to participate and get involved.

[Discourse stresses official texts with dignity, like a declaration of independence based on genuine human values. When scrutinised, however, the rhetoric is ambiguous, and the WWN discovers that the same old expressions are simply repeated in the new discussion document].

The WWN asks:

– What do you mean by "all"? Do you really mean everyone – except women?

Discourse:

– No one wants to stop women using IT. Let me contribute some money and a project. Here you are!

WWN:

– (Oh, what shall we do now?) We must thank him.

WWN goes home and starts to plan:

– Now we've found the crack, girls. Why don't we do an IT project with a feminist profile, in which we can combine IT training based on grass roots democracy and the concept of empowerment as a basis for the development of democracy. Writing will be a way of discovering our individual and collective voice, and making it heard in public.

WWN goes back to Discourse and asks:

– At what level are all citizens invited to join? Do you also want discussion partners, and joint agreement at the planning and decision stages?

Discourse:

– Hmmm . . . you women aren't interested in politics. Look at the figures!

WWN:

– That all depends on how you define the word politics, doesn't it. Who says that politics only belongs to the public spheres reserved for political questions? Who says that the present structures and forms are the only right ones? Political elements are found in the private sphere too, and vice versa, you know.

Discourse:

– Of course it's grass roots democracy we're after!

WNN:

– If you really want grass roots democracy you'll have to work according to a totally different model. It's a different kind of involvement, with different temporal considerations, forms, questioning of existing structures.

Discourse:

– You girls should keep to the political sphere and make your voices heard. It's much better and easier to get out on the Internet.

WWN starts to wonder what this 'voice' consists of:

– You can't talk on the Internet. The only way of communicating is by writing. Then

we'd better get on with developing our writing skills on the individual, collective and public levels.
Discourse:
– [indulgently] Yes, yes.
WWN:
– How can we connect back to the creation of the predominant discourse? How do we make experience two-way? How do we conquer and re-define the public arena – without a project?
Discourse:
– [silent]
WWN [final lines]:
– Cracks make possible small projects with a definite time limitation, as well as a number of other activities -- but is it basically permissible to re-create the predominant IT discourse so that the regulated order of discussion is given a new nuance, and becomes deeper? Place, time and money are fixed factors, but the effects are restricted by these preconditions just as the project form itself has fixed time limits. A project often lives independently of existing structures. Why does no one ask for an overall view which guarantees continuity and a firm base? Is the demand for involvement genuine? [hesitant] We musn't forget the new experiences of the participants, and we shouldn't belittle the value of their experiment. The project is currently being continued in a writing circle. Some of the women have started new IT courses, or decided to carry on studying. Some have become members of a large regional network. And we all continue to re-create the discourse. …

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Chapter 2. Translating and Negotiating Information Technology

Introduction

Has information technology become a black box today? A box that "contains that which no longer needs to be considered" (Callon & Latour, 1981, p. 285). Or perhaps instead one should ask, 'how tightly sealed is the black box of information technology? Can we peep inside it?' Michel Callon and Bruno Latour challenge us to do just that and offer us comfort in our opening attempt: "…macro-actors are micro-actors seated on the top of many (leaky) black boxes. They are neither larger nor more complex than micro-actors; on the contrary, they are of the same size and …they are in fact simpler than micro-actors" (Callon & Latour, 1981, p. 286). They continue: "The sociologists – teratologists – are in warm, light places, the places where black boxes open up, where the irreversible is reversed and techniques return to life; the places that give birth to uncertainty as to what is large and what is small, what is social and what technical." (Callon & Latour, 1981, p. 301). As I read them, both Callon and Latour issue a challenge and console the researcher. This means that you do not, or perhaps should not, keep to ready-made categories and definitions when looking at societies and activities. Open your eyes and dare to see the world with new eyes. Do not confine yourself to the visible structures, even when these seem at first sight to be the only ones that act. By acting they also seem to frame what is possible as well as what is not possible. By framing the rules of the game they also seem to define who is allowed to act and who is not.

By expanding and defining/redefining the structures, frames, rules and actors, new openings are created for feminist IT research, which sometimes becomes stuck in a rut by focusing on exclusions and invisibilities. This expansive perspective also reveals new openings for small actors; it is possible to create cracks and refuse to accept given solutions. As Susan Leigh Star states: "Look at the things that others have forgotten, the things they consider unimportant, the things behind the scenes – and you're likely to find some important…work." (Star, 1991, p. 83).

In my own empirical field studies among librarians in southeastern Sweden I explore how information technology gets translated into work practices. I have looked at a project defined by the librarians themselves as an information technology project. In my second empirical study, I use two case studies of librarians constructing web sites on the Internet. The Internet and the web are often seen partly as an open and undefined landscape where new actors can move freely around and build new partnerships, and partly as a shadow landscape of existing structures and relationships which can close new openings.

I want to position information technology in a physical place e.g., in a specific country, specific region, specific town and/or specific organisation. A parallel approach to this is to place information technology in a context which would perhaps not be the

context traditionally chosen by actors in the field of information technology. My aim is to establish contact with a so-called 'situated information technology.'[1] In my own research this situated information technology covers both a geographical space and a working life context. I present empirical material from southeastern Sweden, more specifically from the county of Blekinge. The libraries and librarians in this county serve as a working life context.

I wish to emphasise the situational approach, as I believe that as a researcher it is not possible to work in a 'a place of nowhere' or to be an innocent viewer. What I wish to achieve by situating information technology is an understanding of IT as doing, something that is carried out in a physical place and by a physical person. As a result, it becomes clear that there is not just one information technology, but many and different information technologies.

In the final discussion I will return to the question "what is information technology?" and try to formulate some thoughts about transgressing the boundaries between the technical and social suits of information technology as well as explore the consequences and effects of such a 'going beyond' approach.

"A way to travel…"

During 1999 I discussed with librarians in Blekinge in southeast Sweden about how they make and shape information technology. I wanted such discussions to form a dialogue with official texts about information technology. The analysis of the official information technology texts (Ekelin & Elovaara, 2001) was manifested in two main strands, namely the technical and the social descriptions of information technology. What I was interested in doing was to see if and how these formulations were moved and transformed into practices. To put it simply, I wanted to see if I could find some traces of the dominating information technology discourses in the work practices of librarians.

I started to work with my empirical material, based primarily on discussions with librarians, after I had finished the first research phase, exploring some of the IT-political texts. I had a clear picture of what I was looking for and a good idea of how to interpret the empirical material. My difficulties started when I noticed that my empirical material did not give me any direct support or any direct connections to my text analysis material. The social and the technical elements were not there, or so I thought. There I was, with the results from my fieldwork, and none of the answers I was looking for. The material looked like a collection of small fragments. I read the transcribed interviews and listened to recorded discussions once more, but the librarians did not seem to talk about information technology either in terms of technique or as a part of society. They seemed to talk about projects, money, computers, caretakers, and html editors. Should I restart my field studies, abandon my librarians and look for

[1] I find the notion of situated knowledges inspiring. For further reading, see Haraway, D. (1991), Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective in Simians, Cyborgs and Women: The Reinvention of Nature, pp. 183-201.

something else which would hopefully be somewhat clearer, purer, or, to sum it up, something "more information technology"-ish? These were my first thoughts.

It was during the "I am getting desparate" period that I found Michel Callon's article about the development project which had as its goal to introduce an electric vehicle in France in the 1970s ("The Sociology of an Actor-Network: The Case of the Electric Vehicle" (Callon, 1986)). In this article, one of the most important introductions to Actor-Network Theory (ANT), Callon identifies how the engineers employed by the Electricité de France (EDF) initiated a development project, intended to create a new type of vehicle which does not use fossil fuel as a source of energy but electricity instead. What struck me in this article was the way in which Michel Callon follows the movements inside this development project and sees who and also what are involved and what these involvements demand of the different participants. A project, which for an outsider would have been both very abstract, technical and daunting, is broken down into pieces, making each piece more manageable and comprehensible, when talking about contents and time. What is also unveiled are the movements inside and outside the project as well as the interactions keeping the project together as well as the separate actors and actions.

In order to carry on I divided Callon's article into more detailed components. I wanted to see if the idea of transportability[2] really was valid. It was necessary if transportability was to be an option to find out more concretely which elements I could take with me and how to implement these into my own empirical material.

Story – narrative and epistemology

First of all, there was this beautiful story. When using the word story I wanted to look in two directions at the same time. We can talk about a story in terms of aesthetical aspects and in terms of form. Michel Callon's article is an example of a fluent narrative with its own internal logic and structure. There was a clear chronology and there was a story line. It was like reading a short story. One often hears – and I also make similar comments – that scientific articles are boring; they do not engage the readers, they do not make the readers angry, happy or sad. They are one-dimensional and impersonal. They are often written without an active subject and with different passive constructions dictated by the grammar (Trojer, 1995, p. 49). How can you write giving greater consideration to language and form? This was the question Callon's article helped me to formulate.

The other direction when speaking about stories points to the landscape of epistemology. It is possible to use and understand the concept of story as a metaphor for our epistemological platforms. How do we do research? Whose knowledge are we interested in studying? What do we count as knowledge/scientific knowledge? How do we gain access to scientific knowledge? How do we build scientific knowledge in our research practices, including the ways we represent our research? These are some

[2] With transportability I mean that the analytical percpective and analytical concepts can be transported to other research and analytical contexts

of the questions that connect Callon's and my own epistemological questions. When I say that we tell stories we also choose in a very fundamental way our epistemological platform.

Catharina Landström, a Swedish researcher in the field of theory of science and research, writes: "It has been normal to regard scientific texts as transparent presentations of the real conditions, a text is only an unproblematic medium that does not influence the object that is represented" (Landström, 1998a, p.44). This has meant that also boundaries between what has been categorised as fact and fiction have been established and survived in science and in scientific research in general. Within feminist research, the transparency of scientific work and its representations has been discussed and problematised. If we no longer want to accept the universality and generality of science in the sense that science retells and reproduces reality, and this retelling and reproducing are always objective and true, we rather end up in a position where "how something is written becomes important in consideration to what we are going to write about." (Landström, 1998a, p. 44). The story is not a description of what is going on, but it also creates what is going on, the research object. The constructive perspective on scientific writing provides several paths to follow. What I tell is not a blueprint of reality. The choices are mine and the story is mine. This gives me more space to choose and create my story. I do not have to tell the whole world, from a perspective of nowhere. The dream of telling universal scientific true stories from seeing from nowhere, the god-trick as Donna Haraway calls it, is broken (Haraway, 1991, p. 189). Donna Haraway speaks about situated knowledges which do not refer to a place but instead to what she describes as situatedness (Haraway, 2000, p. 71), to our epistemological consciousness. The story is mine, I tell it through my body and my experiences; the only way of telling is "to be somewhere particular" (Haraway, 1991, p. 196). A story is always a manifestation of partial perspectives, in the sense that there can never be one single story explaining everything. At the same, it is essential to remember that this line from one single story to a multitude of stories does not speak for relativism in the sense that 'everything goes'. It just reminds us of something that is, in fact, very simple. It is impossible to be in all places, situations and positions at the same time. The partiality and situatedness lead us to understand that there is no way of talking about knowledge in a singular form; we must refer to knowledges as a plural. How then can we avoid both the positivistic claim of objectivity and the relational claims of truth? This has been a major thread in many feminist epistemological writings. How can we be situated and positioned without being innocent and blind becomes a question of how to join the partial perspectives, and how to relate the partial stories to other such stories. Donna Haraway states that we need to know: "… how to have simultaneously an account of radical historical contingency for all knowledge claims and knowing subjects, a critical practice of recognizing our own semiotic technologies for making meanings, and a no-nonsense commitment to faithful accounts of a 'real world', one that can be partially shared and friendly to earth-wide projects of finite freedom, adequate material abundance, modest meaning in suffering, and limited happiness." (Haraway, 1991, p. 187). This freedom of choice also reminds me of the responsibilities involved in making choices. What and whom

do I include? Where do I start? What kind of information technology do my choices and perspectives create?

The way John Law talks about the researcher's accountability shows how close he is to feminist epistemological thoughts: "This is a chapter. An article. Or a paper. Let us take note of that. But the business of writing – and talking – raises serious problems. Difficult questions. Questions to do with materiality, method, knowing, representing and signifying. Questions of authorship, authority and the nature of our field. Questions concerning the character of what it is to be an expert in 'our' field." (Law, 1998, p. 88). John Law's words summarise many of the aspects of writing that make writing such a difficult business. He really asks us what it "mean[s] to narrate – that is to write or give a lecture" (Law, 1998, p. 90), and we should also add, what it means to write "formula, diagram and tables" (Mörtberg, 2000, p. 56).

All these various aspects and questions of writing gave me the first component, namely the story, understood both as a narrative and an epistemology. I could now try to transport these components to my own research.

Place and time

What was this internal logic and structure I referred to in Callon's story all about? It was a story about a geographical place, well-defined, and also a story about a time period that was exactly defined. The place was France and the time the 1970s. It was also a story about a well-framed phenomenon, namely about a development project that was initiated in order to develop an electric vehicle. Let's stop here and see if there were corresponding elements in my material. Let's look first at the issue of place. I had decided that my research field would be the region of Blekinge, a county in southeast Sweden. One could ask: Why Blekinge? There are many possible answers to this question. There is a very pragmatic way of looking at where someone´s research is geographically located. You just frame some place that is reasonable in terms of size. Besides the practical arrangements, which most often have something to do with time and money, there were actually other good reasons for choosing Blekinge. In terms of information technology, Blekinge is an extremely interesting region. It is one of the many regions in Sweden that were earlier dependent on the metal industry; and in Blekinge's case, also on fishing and the military. During the last thirty years a great number of these branches have disappeared. Blekinge, as all similar regions with high unemployment figures, has been looking for new industries and new futures. One of the municipalities in this region, namely Ronneby, can be used as a point in case. Early in the 1980s, some municipal politicians had heard about the expanding field of the computing industry and especially about developments in software. In the beginning of the 1980s, the technology centre known as Soft Center was established. What later became the leading activity for almost the entire region was computers and information technology in general. In addition to the industrial and business development, Blekinge has been a base for many information technology projects e.g., school and library projects. The change from old industries to new information technology businesses has not been easy and painless. Blekinge was classified as a regional support area by the European Union. This and many other project forms has meant that a

great deal of external project funding has found its way into Blekinge. In the middle of the 1990s, Blekinge was declared a full-scale information technology laboratory[3]. If the research field is information technology and its many shapes, Blekinge is a rich region from which to collect empirical material.[4] If we follow the traces of information technology in Blekinge, we discover the first time frame, namely the 1990s. Now I had framed both the geographical place and the period of time, albeit rather broadly and vaguely.

Project

Michel Callon's article is about a project aimed at developing an electric car. Here we have a frame that is even more exact and closely defined in place and time. What the project as a frame provides is more specific time limits, because it was possible to find out when the project was started and when it was declared finished. Thus far I have only talked about information technology as a general frame in my own work.

Inspired by the VEL project, I took a closer look at my own material in order to investigate if it would be possible to find something as frameable as the VEL. This is what I found: a well-defined information technology project known as the BRUK project. BRUK is an acronym for "Bibliotekens Roll i Utbildnings- och Kunskapssamhället"; in English, "Libraries and their role in the education and knowledge society". The project was initiated by the five municipal libraries in Blekinge in co-operation with the university library in the region. According to the funding application directed to the regional office of the European Union, the aim of the project was described as follows: "The BRUK project is part of a collected county-wide strategy to develop and increase access to IT services for small and medium-sized enterprises, students/distance students, and the general public." (The Bruk Project). The project formulation was naturally only the official project formulation. In addition, there were several other reasons and motives why the libraries initiated this project. In talking about reasons and motives I have already moved on to talking about actors and translations. I conclude by stating that the project time was two years, from 1998 to 1999. This means that I had a framed project comparable with the VEL-project in terms of frames for a story and concrete practices.

Analytical concepts

The aspects of Actor-Network Theory vocabulary used by Callon I found particularly useful were the concepts of 'actor' and 'translation' and, of course, the way in which the actor-network approach works with relations, in other words, networks. By using concepts as a means of analysis I could start to look at my empirical material and sort it out by quite simply asking, 'who is acting?' When trying to follow some of the traces Bruno Latour and Michel Callon have left behind, I found the notion of an actor very useful in my own cartography. Bruno Latour asks: "What is an actor? Any element which bends space around itself, makes other elements dependent upon itself and translates their will into the language of its own…By stating what belongs to past, and of what the future consists, by defining what comes before and what comes after, by building up balance sheets, by drawing up chronologies, it imposes its own space and time. It defines space and its organisations, sizes and their measures, values and standards, the stakes and rules of the game – the very existence of the game itself." (Callon & Latour, 1981, p. 286). And as I found actors I could ask, 'what is happening between these actors? What kinds of translations are being done? Could I find translator-spokesmen who define the identity of other actors, give them a role to play, decide their size?' (Callon, 1986, p. 24). Could I find the points of obligatory passage that translations determine: applications, reports, goal descriptions? (Callon, 1986, pp. 26-27). The concepts of 'actor' and 'translation' were a 'seeing' device by which I could give a focus to my empirical material. Actor-network theory appealed to me because it does not stop at naming the actors but focuses on processes and activities going on between actors. My own understanding of information technology as doing corresponded well with this perspective. By focusing on doing it became clear that one of the consequences of this particular focus could be that information technology is not one single information technology but something shaped in many ways depending on who the actors are and the interactions between them.

Transportation

The planned transportation from Callon's article to my messy material seemed, in fact, to be working. First of all, I got analytical tools and instruments. By using words like tool and instrument I refer to the way craftsmen use their instruments and tools, where a complex relationship consisting of a feeling for tools and instruments is a vital component of creating the final product, be it a chair or a boat. We are far away from the way we sometimes use words like tool and instrument i.e., as a plain and instrumental way of using models. I choose not to call Callon's way of working a method, not if by method we mean the ways we usually collect empirical material, such as observations, interviews and so on (see e.g. Harding, 1987, p. 2). If I wish to find a metaphor to describe how Callon´s article could be transported in the first place, I would be looking for something that is connected to perspective and distance. I could visualise my way of working by talking about lifting myself above my material in some way. Like first standing nowhere, not exactly knowing where to turn to be able to reach my goal and then suddenly being like a bird or someone sitting in a crane. My material evolved into an aerial photograph. A photograph that shows how the roads are connected to each other, where the houses are situated, and where the forests and the lakes are. It shows me a landscape. It is not a map of the whole world; on the contrary, it is just a map of one village or a part of a region. Even if I move above my material, it is not about moving away from it. Only for a short moment I change my place of viewing in order to be able to return back to my material. Here the line between the eye seeing everything from nowhere and the eye trying to be sensitive is extremely thin and vulnerable.

[3] The phrase was launched by IT Blekinge, a special regional development program and association in the end of 1990s

[4] The description of Blekinge is based partly on a report written by Uhlin & Stevrin: Ronneby – Sveriges Soft Center. En PM om en utvecklingsidé för Ronneby kommun [Ronneby- The Soft Center of Sweden. A PM about an development idea for the Municipality of Ronneby], Ronneby 1983 and on a discussion with Sölve Landén, the information manager in the municipality of Ronneby, 28th of August 2000

Callon's article gave me a language with which to talk about information technology, a language that made me free from ready-made definitions. It was like somebody whispering in my ear: 'look around at what you see, and look extremely carefully. Look at things and people that are perhaps so small and unimportant that they have almost become invisible.' What was satisfying with the analytical approach of working was that it helped me to see connections and relations between fragments and pieces, the ones initially totally separated from each other. I could see connections between the heterogeneous elements. I could understand why some things happen, why organisations and people start to collaborate and co-operate. These 'why' answers developed in response to the 'how' questions which formed a starting point. I could make a story with not only human actors but a story where computers and other non-humans were as important as human elements. It supported my own very vague thoughts about the hybrid character of information technology. In my text analysis, I had found that there were two main ideologies when talking about information technology, namely the social and the technical (Elovaara, 2001). What really made me anxious were my own efforts to keep the two elements separate, and how the efforts of separating did not seem to work in a satisfactory way. What Callon made me reconsider was that perhaps there is no need to keep them separate. The social and technical are intertwined so it becomes impossible to keep them apart. Callon's story helped me to see that I can talk about information technology without trying to include the whole world and every single possible element. My story can be a very local one. It also allowed me to select a different starting point thereby avoiding what I would usually regard as an important actor. Information technology is made as much in local libraries as it is at the headquarters of Microsoft. It also helped me to understand why people and organisations that do not initially seem to have the same interests and goals can become partners. All these aspects are very closely connected to questions of methodology and epistemology. Could I say that Callon's article lent an analytical, methodological and epistemological approach to my research?

So the following two chapters are about the actual 'doing' of information technology. I have chosen to describe one library project which has been defined as an information technology project. I am going to present the history and origins of the project known as BRUK, see how the latter developed and what happened inside the project by identifying some of the actors and following the activities that took place within the framework of the project. My other empirical material deals with how to create web pages on the Internet. Internet has become a symbol for information technology as a whole, so it gives an opportunity to see who the creators are and what happens when the making of web pages is initiated inside an organisation. Actor-network thinking is interwoven in this story, or perhaps it is more accurate to say that without the perspective of the actor-network seeing the stories could never have been told in the way I am going to present them.

Towards Stabilisation – The project "BRUK"

In the summer 1998 the public libraries in the county of Blekinge, together with the University of Karlskrona/Ronneby library contacted the vice-chancellor of the university.[5] The spokesmen for the libraries started to discuss how the libraries could collaborate with one another. As a result of these discussions the university sent a project application to the European Union regional office in Blekinge. BRUK (this is the age of acronyms! BRUK stands for "Bibliotekens Roll i Utbildnings- och Kunskapssamhället", in English "Libraries and their role in the education and knowledge society"). The project was allocated 3 million SEK [approximately 360 000 USD] and a further 3 million SEK from an additional external source.

The aim of the project was defined in the application and which later on was used as a goal description for BRUK: "The BRUK project is part of a collected county-wide strategy to develop and increase access to IT services for small and medium-sized enterprises, students/distance students, and the general public." (The Bruk Project).

Those involved in the project were the head librarians of the five public libraries in the county of Blekinge, the head of the university library. These six representatives together with the project leader also formed the management group for the project. Two more people were centrally employed. The project budget also made it possible for the local libraries to employ part-time staff.

What happened when the project started? What happened with the 6 million SEK? What did the management group do? What did the project manager do? What did the two employed in the project do? What did those employed by the local libraries do?

During the autumn 1998 the IT studios at the participating libraries were developed. The project leader contacted a person who was employed by the university and asked him to make a list of the equipment and the software needed. Discussions about standards, versions and the rules governing official purchases became central issues and, needless to say, the subject of lively debate. In the discussions concerning both economy and technology, the libraries established contacts with the IT offices in their own municipalities.

Each of the library IT studios was equipped with "7-10 computers with Internet access. The computers are equipped among other things with software for word processing, calculations, data base management, design, layout, web page design for the Internet, as well as conference equipment for the Internet including Net Meeting with camera and sound. The IT studios are also equipped with scanners, digital cameras, CD burners, printers (b/w and colour), data projectors, graphics tablets, imaging programs, manuals, magnifying software and speech synthesis for the visually

[5] My discussion of this project is based on the written information available on the Internet, discussions with the project leader and with one librarian involved in the project as well as personal experiences as one of those who initiated the project.

impaired etc. The IT studios also have extensive videoconference equipment for ISDN communication."(The Bruk Project).

How were the above facilities used during the project period? Let us go back to the project goal description: "[to]…increase access to IT services for small and medium-sized enterprises, students/ distance students and the general public."(The Bruk Project). The two project members employed to serve all the participating libraries started to translate these formulations into concrete activities. They contacted other projects, organisations and groups whose goal and aim were to work with small and medium-sized entrepreneurs (SMEs) and increase the use of information technology among them. These other actors were already more established, partly because they had been operative long time before the library project started, and partly because their only original and basic idea was different development activities for SMEs.

Three information meetings about Internet business information were held for enterprises during the spring of 1998 "in co-operation with the Alliance project[6]. During the autumn 1998 a total of 23 meetings for entrepreneurs…was carried out…These meetings attracted more than 100 participants. The practical exercises in video conferencing were carried out in co-operation with Lundaforum[7]… During the spring of 1999, the libraries carried out 24 topical evening meetings and one afternoon meeting … for entrepreneurs … These attracted a total of 280 participants … A series of talks, via video conferencing, on the overall topic of 'IT in the future' in co-operation with the Learning Lab[8]…" (The Bruk Project).

At local level, activities were partly organised by the central staff and in part by the libraries themselves. The seminars, demonstrations and workshops in particular directed to SMEs were the same for each of the participating libraries. The two centrally employed people were also those in charge. Advertising and information to local businesses was taken care of by the local libraries. "We established contact with the municipal office for business development. There was one woman there, and it was through her that I was put in contact with every shopkeeper in town. … Contacts are important. It doesn't matter how many leaflets you send, it is the personal contacts that really matter…"[9]

In my reading of the official story of the project as presented in the application, in the material available on the Internet, and in the discussions with the project leader

6 The Alliance project is a project between Föreningssparbanken [a Swedish savings bank], Telia [the Swedish telecom company], and the municipalities of Karlskrona and Ronneby [both towns are in the county of Blekinge]. The motto of the project is "Together we create projects which all aim to make the new information and communication technology accessible for everyone", http://www.allians.org/

7 Lundaforum is a Swedish brand experience company, http://www.lundaforum.se/

8 Learning Lab "is a result of a collaboration between the University of Karlskrona/Ronneby and Ronneby municipality whose aim is to develop network based learning as well as pedagogy, didactics and research within the field Applied ICT In Teaching", http://www.ronneby.se/learning-lab/eng/background.htm

9 Discussion with one of the participating librarians on 24th February 2000

and one of the participating librarians, I focus on several points, and in particular on the many connections in which the project became involved. These were necessary in order to "sell" the project idea, first to the vice-chancellor of the university and subsequently, to the financiers. These partnerships also played an important role once the project application was being formulated. In order to gain European Union funding the target group must be the SMEs. And in order to win acceptance and support from the university, the target group of students and especially distance students formed the second target group. The third group, the general public, was, as I see it, the result of negotiations. It was important with respect to the original concept of the the public library ideology to include this group. Public libraries in the Nordic countries have their roots in the middle of the 19th century. The public library idea was closely connected to the idea of 'folkbildning'[10]. Their mission was to create a public place accessible to all citizens in order to find literature and information. As an underlying ideology it was a question about educating the citizens and enforcing their competencies in the growing western societies. Valfrid Palmgren was one of the leading figures of the public library system in Sweden. In 1909 she travelled to the United States in order to research the library idea. Afterwards she wrote a book based on her experiences during this journey. In this book "Bibliotek och folkuppfostran [Library and Folk Education] (Palmgren, 1909) she wrote that she never before had met "people with greater passion, who are more altruistic and more dedicated" (Palmgren, 1909, p. 160) than these American librarians. She also wrote that according to "elderly traditions librarians were supposed to be persons whose interests and hearts were devoted to books. American librarians divide their hearts between books and the community, people they serve and their desire is directed to intertwine people and books. Library is a home for everyone, a place where all children can think greatest thoughts and dream most beautiful dreams. And in these libraries it is the American librarians who rule as hosts and hostesses, one of the most loveable and discrete hosts. They do not leave anything undone in order to win reliance and who, with a discrete attention, care for their guests, the American public" (Palmgren, 1909, p. 160). So what the librarians did in the Bruk project explored in my paper was very closely connected to the underlying message of Palmgren, namely that the librarians' profession is about caring and loving. The forms may have changed, from books to information technology, but the librarians in my case study explicitly demonstrate that they are still practicing caring and loving. They care about the citizens' computer skills and by arranging training courses for senior citizens they wanted to contribute to the democratic idea that nobody should excluded from the building of the information society.

Neither the libraries nor the individual librarians were able to redefine the project at local level, even if "I think that what they [=the libraries/the librarians] really wanted to work with, were the distance students and other students, and that the libraries wanted to create a place for the people in general. A place where people would have an opportunity to try out the new technology. The SMEs were involved as a result of European Union money."[11]

10 see description of the word 'folkbibldning' on p. 121

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But becoming connected and building up contacts is also a question of making oneself visible. As the project leader expresses it, "libraries have improved their status. It is easy to forget them and marginalise them. There are groups and professions that can replace libraries and librarians. Libraries can be turned into book-lending stations."[12] The issue of what libraries are all about seems to be one of the threads that runs through the entire project. The project in itself aims to show that libraries have a role to play in the new information society. The reasons given are identical to those suggested when the very existence of the public libraries was debated, namely that a library is a democratic place, open to everyone. But libraries also want to show that the library of today is modern and not that "empty and quiet library one remembers as a child."[13]

There was also an official crack in the project description, namely in the reference to the third target group "the public in general". This could, for example, mean that a library could co-operate with senior citizens and give them training courses. "We talked about what a computer is, how you handle the mouse, how you use your keyboard, how you read your screen. How you understand information, how you read the information shown on the screen."[14] Even when talking about the target group SMEs, which as already mentioned above was perhaps not a favoured group among librarians, the use of the library was the motivation: "But it has been enormously positive all this. The shopkeepers have not perhaps visited the libraries, at least not here. Many of them have not been here at all or perhaps once or twice when they were small. And now they think that the library is great and have started to come, in small numbers at least. They have noted that the library is a place that many people use. Many shopkeepers were not aware of this."[15] This generally positive attitude towards the library does not necessarily have anything to do with the IT project goals, to using information sources professionally: "there isn´t anybody who asks for business information…"[16]

Introducing information technology in the shape of a relatively wide and comprehensive project can also stimulate internal discussion and debate about the basic function of a public library. Why should one put a lot of money into computers these days when you can hardly afford to buy books? This is the essence of the dichotomy. But those involved in the project did not see that the alternatives were/are either books or computers. "Now we feel everyday when making decisions about what can be purchased and what cannot that we have to be very restrictive and repeatedly say 'no, not this one'. It does not feel good. It is a bit strange when we have a good deal of money to buy machines, but cannot afford to buy this or that book. We also invest in discussions about fiction, invite authors and organise literary evenings. It's a long time since we did things like that. But I have also seen this project as a 'folkbildningsprojekt"[17]."[18] What the speaker has in mind when referring to this side of the project are all the various training courses e.g., for senior citizens, the opening of IT studios where everybody who is 18 years of age and over is welcome to use the facilities free of charge, and lectures using video conference facilities.

The House that Jack Built…[19]

Why did the libraries start this project? To answer this question we first have to bear in mind the chronological and physical context of the project. In the mid-1990s the county of Blekinge was declared by the European Union to be one of the regions in Europe entitled to structural funding. The regional EU office was established to administer use of these funding. At the same time the IT-Blekinge association[20] was founded. The association was given semi-governmental organisation status and the responsibility of co-ordinating the special information technology projects developed in the context of the structural funding. The region of Blekinge had chosen the topics which would receive regional EU funding. One of these was information technology. The official program document specified the criteria which every project application must fulfil. These criteria were to create new jobs, invite women to choose non-traditional jobs, develop distance work and distance education, develop the countryside, strengthen the opportunities for SMEs, improve efficiency in health care, facilitate the democratic process and increase citizen involvement in questions concerning regional development (The Bruk Project).

The European Union, the European Union Region Office in Blekinge and the IT Blekinge association become actors in (at least) four important respects. First of all, they were the actors in different documents describing the state of society today and tomorrow. The whole county, officially at least, became seeped in these descriptions. We can keep in mind that there were both simultaneous regional, national and international actors disseminating the same message: information technology is a vital and necessary phenomenon for future development. And secondly, the three actors mentioned above also had control over funds. Thirdly, access to funds was directly related to the fact that irrespective of how you wished to use funding, it was necessary to accept and adapt the criteria and interpretation of information technology already laid down. And finally, these same actors created 'the project culture', in the sense that all activities financed by official funding must have a formal deadline. The future stability and continuity of project activities was not necessarily forcibly implemented by the mother organisations.

[12] Discussion with the project leader on 23rd February 2000
[13] Discussion with one of the participating librarians on 24th February 2000
[14] ibid
[15] ibid
[16] ibid

[17] The Swedish word 'folkbildning' is often defined in dictionaries as 'adult education'. This is only one dimension of the expression, however. In addition to adult education the Swedish word implies certain ideological aspects related to the German expression 'Bildung' and certain aspects of the social democratic ideology of equality and everybody's right to education and knowledge
[18] Discussion with one of the participating librarians on 24th February 2000
[19] The House that Jack Built, a children´s poem of contacts, interactions and networks, see, for example, http://www.michaelmade.com/html/jack.html
[20] A special regional development program and association in the end of 1990s to promote IT development and implementation in the county of Blekinge

Actor-network theory specifies that networks are open in the sense that they are not always given, and therefore not always stable structures. Discourses in which the EU, the EU Region Office and the IT Blekinge association formulated their ideas about the importance of information technology were open to all and were an opportunity for everyone to participate in the construction of the new information technology society. By leaving the field open the actors were able to invite themselves ("everybody is welcome"). In this way perhaps potential actors were defined by discourse which used descriptions and formulations that encouraged potential actors to recognise that they themselves are the very subject of the discourse. In fact, there were some limitations from the very beginning in terms of defining who is included in the description 'everybody' e.g., private people and non-organised groups such as loose networks were excluded as applicants.

But the libraries 'bought' the description of the future and in so doing they also accepted the project form, the target groups and information technology. And perhaps all this was indeed truly fortunate. The project form enabled trials and renewals inside existing organisations which could otherwise have entailed a long period of planning and implemention. And when talking about target groups and the libraries being 'open for all' why not also include students and SMEs? With respect to the issue of information technology, the libraries have, of course, used information technology in their internal administrative systems for a long time, but they have also seen that the libraries can play a part when different applications of information technology are used. In BRUK this was brought about in three different ways. When working with the SMEs, information retrieval was the main issue, and when working with the students access to IT studios was important. The dissemination of the skills necessary for the use of computers was generally defined as a task for librarians. But the libraries wished, of course, to raise their status in the region; they believed that information technology would give them the keys to the corridors of power.

Creating Web Pages

Anna, a librarian working at an educational institution, has been allocated funding for a project which aims "to deepen and develop co-operation between educational courses and the library, to integrate the methods of information searching in the educational work, and to use the possibilities of web techniques to strengthen communication between a student, library and the teacher."[21] At first sight the project seems to be a rather small one in terms of funding and participants. There are only two people mentioned by name in the project application, Anna and the head of the school. The project is funded by external sources together with over 20 other projects, all of which aim to develop the use and applications of information technology in different educational institutions.

In practice it is Anna who is in charge of the project. In order to achieve the goals for the project she must find collaborators and partners from among teachers. In order to create the Internet-based library services, she has understood that there are other

[21] The original project application is dated 19th November 1999

members of her organisation who are actually the key figures. They have no formal and defined position in the project. Anna has identified all those who in one way or another influence the project: the head of the school, the financial manager of the school, the administrative personnel, the "computer man" and the beadle. The head of the school and the financial manager occupy positions which give them considerable formal power and influence so it is easy even for an outsider to understand why Anna considers them to be among the key figures. These positions and titles are not only words or abstract boxes in the organisational scheme but living people. This fact is confirmed by Anna's observation that "…I am well in with the economy man…"[22]

When Anna starts to talk about the administrative personnel and the beadle she understands that behind the open and organised structure of the school there are also shadow organisations consisting of people who on the basis of tradition, skill or personality have considerable influence. Here it is a question of understanding what Anna can do by herself, and what she cannot.

The project entails updating the web pages of the library. This is achieved by moving them from one computer server to another. Anna has neither the formal nor the informal power to do that and is dependent on the 'computer man'. What is urgent and crucial for Anna is not necessarily a high priority to a computer expert. Anna also needs to obtain an html-editor for her own PC at school. When the web pages were saved on the external server, Anna had no access to the files. Instead she could buy the services from the external web provider. One reason for this arrangement is that the school at which Anna works is part of a larger regional organisation which has opted for a highly centralised Internet solution. The software side of the project makes Anna very nervous, partly because the computer expert thinks that one should stick to the editor used before, and partly because Anna feels that she does not have the necessary skills for this kind of software. The next step is for the beadle to make a telephone call to the regional organisation and try to find out if they have several software licences. And so it goes on. "I really don't want to have this many people involved. It's a real mess. If I don't agree with the computer man and the beadle … He is a central figure, one of the cogs in a big wheel. And the relationship between the two boys and their areas of responsibility is unclear. He has been here for a hundred years, he knows everything about everything…"[23]

Eva is also a librarian, working at a different school. In the autumn of 1999 she was asked by the head of the school to create web pages that will work as entrée pages for the school on the Internet. The existing site has, says the head, been heavily criticised. Eva says that as far as she can see this is the official reason for updating the web pages. She also thinks that the pages are the school's interface with the outside world. It is important how the visitor to this site is welcomed and how s/he and the page, including information and layout, 'meet.' "But it is also a question of power", says Eva.[24] Behind the Internet project lies a new organisation of the school system. The head of

[22] Discussion with Anna on 18th February 2000
[23] ibid
[24] Discussion with Eva, 6th March 2000

the school feels that his part of this system is inadequately represented and has become invisible on the Internet.

Another issue in the ongoing power game is that a person had already created the earlier web pages. This person worked on his own initiative. Eva believes that this should be rectified as there is no structure or plan for the Internet. She also sees the problems that will arise when she accepts the assignment and starts her part of the work. In this situation Eva must find others outside the school with whom she can begin to collaborate. Some of these are professionals working with web production, others work at other schools. Parallel to building up these contacts, Eva participates in an hmtl-training course, where the original web person at her school explodes and accuses her of intruding and instigating the re-structuring of the web pages. Eva is very understanding when talking about this person: "I would have reacted in a similar way. I can identify with him, but at the same time I have to fight for my own competence. This whole situation is due to lack of clarity …"[25]

The Internet has sometimes been described as an open landscape where new actors are welcome. Eva agrees with this definition. She says that "the librarians' competence becomes visible. It is more a question of skill than formal titles and positions." But at the same time, work with web production demands technical expertise, and that is not something that librarians possess automatically. "Absolutely, I feel that I'm handicapped."[26]

The web can be an unexplored landscape and an arena above or in addition to the old structures. But working virtually presupposes physical and bodily contact with other human beings. If the old structures are not based on the idea of co-operation and collaboration it may be problematic to understand web activities as a joint enterprise where relations in the real live world are based on individualism, concurrence, hierarchies and domination. "But the web can make it possible to find new contacts and partnerships. It has been really nice to work together with others when creating the pages. We have different perspectives. So the possibilities are here and there…"[27]

It is fascinating to follow different ways of creating web pages. We see a mixture of human and non-human actors (See e.g. Callon, 1991, pp. 140-142). We have met the librarians, the heads of the schools, the computer expert, the web person, the beadle, the financial manager as well as PCs, html-editors and web servers. We have seen all the negotiations: the librarian negotiating with the beadle, the beadle negotiating with the regional organisation, the librarian negotiating with the html-editor, the files negotiating with the web server, the librarian negotiating about money. What holds all these components together is information technology.

I have chosen to follow the processes together with the librarians. This also influences the way in which information technology is defined. For the librarians, the important

[25] Discussion with Eva on 6th March 2000
[26] ibid
[27] ibid

issue seems to be how to organise information on the web pages. But to be able to do that, it is necessary to have access to the net, to the html-editor and the web server and so on. From the computer man's point of view, perhaps it is the computer net, the technical infrastructure, that is information technology. For the head of the school it may be the IT project and access to external funding that is information technology. But the html-editor without skills would not be of any great value, neither would the web server without Internet technology, the web pages without the contents, and the contents without the librarian, and the librarian without the teachers and the students.

One of the issues of interest in the stories told by Anna and Eva is the question of visibility contra invisibility in work. Working with web pages demands a great deal of effort both in time and mental energy to carry out the so-called shadow work or articulation work. Susan Leigh Star and Anselm Strauss define articulation work as follows: "Articulation work that gets things back 'on track' in the face of unexpected contingencies." (Star & Strauss, 1999, p. 10). All people, situations and problems caused by those without any formal place in the project result in a great deal of the visible work becoming invisible. This invisible work which Anna and Eva really cannot manage openly frustrates them, of course, and it also means that producing the final product, the web pages, takes much longer than originally planned. They must build up a contact network and find support. It is not, however, a matter of co-operation as it would be understood by an outsider. (Star & Strauss, 1999, p. 10).

In my previous discussions with some librarians about the use of information technology, they almost invariably talk about the difficulties in communicating with computer experts. The latter in the previous descriptions are generally the ones who work with support at help desks. The communication problems are language-related and entail understanding library needs. The same issue is raised by Julian Orr when he writes about the photocopy technicians (support and repair), but this time we hear the story from a completely different angle. In the stories of Anna and Eva it seems computer experts play a very minor role when it comes to web pages. There might be several reasons why this is the case. In the case of Anna, the structure of her work organisation seems very unclear. She has just started her project, which means that what she must do first is draw a map showing the different actors. She has not yet really begun to work with the computer-based part of her project. In Eva's case, she has very well-functioning relations both with people with web skills and with the computer technicians at her school. She also has the skills needed to create web pages. And perhaps these stories also remind us that information technology does not always have to be primarily a technical project. It is a question of moving in the "matrix of invisible and visible work" (Star & Strauss, 1999, p. 15) carried out primarily by embodied human beings.

Discussion of the ANT-analysis

Let's return to the section in this paper where I discussed how I was influenced by an early ANT article written by Michel Callon. I gave a number of illustrations of how the actor-network approach gave me new perspectives and increased my understanding

as a result of ANT's analytical vocabulary, the way Callon told a story where humans and non-humans were mixed. It also demonstrated an epistemological approach to me. The story of the BRUK project was completed. The story was a neat, coherent one involving both human and non-human actors. It was built on a clear network structure with translator-spokesmen and simplifications. However, during the writing process serious doubts began to emerge.

I was worried by the story I had created. Was it not too neat and coherent with all its various bits and pieces placed exactly where they seemed to belong, as in a puzzle? It was the easiness that I was not happy with. Was the project I was describing really that fluent and unproblematic, or was it my story about the project that was too fluent and unproblematic?

Similar considerations can be identified in the internal discussions concerning the current state of ANT. According to John Law and Bruno Latour, the notion of network has lost its power as a strong analytical metaphor. According to John Law, the ANT stories have been infected by hegemony, functionality and managerialism. What makes Law even more worried is that the stories ANT tells are not only texts but they are performative and thereby reproduce the phenomena they describe. (see e.g. Latour, 1999, Law 1999, 2000). The BRUK story was definitely functional. My story was a convincing one, showing that the project was working. It was convincing because the BRUK project was successful indeed. What I was missing were all the negotiations necessary for the success of the project. How can one describe the hard work necessary for the computers to be installed, the network to function, the phone calls to be made, the information brochures to be printed and disseminated, and the librarians to find space and time to express their doubts?

I was talking about the missing contradictions and the missing resistance and about the closeness of the network I had constructed. The network-based story was too tight. It needed more life, voices and layers for it not to be discarded. The story needed a tougher incentive of 'critical welcoming' (Lykke, 1996, p. 23). Taking these thoughts together with some of the ANTa articles on the same empirical material from the BRUK project, I could see that beyond the polished facade of the project something else was happening. What became increasingly visible was that in addition to the official project which was researchable with the aid of written documents, other things were occuring. The project application specified that the project was initiated to increase the use of information technology among the small and medium-size entrepreneurs. If one reads the official project report, this is exactly what happened. A number of database demonstrations, video conference training sessions and lectures about electronic business were organised. However, the librarians who worked within the project did not remain within the official project frames but used the project to make small interventions both in- and outside the project itself. They did not work all the time with small and medium-size entrepreneurs only. They actively took steps outside the project borders by arranging computers courses for senior citizens. The project was the same, though not constantly so. By making detours, the librarians actually strengthened the project because they found greater use for all the artefacts

purchased with project money, and the project also became known among the general public. The librarians strengthened their own computer and training skills by doing more training than was actually planned for inside the project. The librarians increased awareness of the democratic rights to computer literacy among groups that may not always be regarded as the highest priority, in this case by inviting elderly people to computer and Internet training courses.

I had also discussed with two school librarians how to create web sites. I had done the recorded interviews almost at the same time as I collected material from the BRUK project. My intention was to use the same analytical procedure inspired by ANT as for the BRUK project. If I had problems in analysing and writing about BRUK, it was really nothing in comparison with working on the new interviews. I wished to draw neat networks, identify actors and translations. The librarians talked about caretakers, headmasters, vague assignments, people put aside, fear, uncertainties, computer servers they did not have access to, and html editors they did not know how to use. Initially, I decided to put the notion of network aside. I kept the notion of relations, relationality and non-existing borders between humans and non-humans. I concentrated on listening to how my informants talked about things and people who were not present, and things and people whose contribution to creating web pages were not visible. By changing the perspective from focusing on IT to focusing on heterogeneous materials instead I could tell another kind of story about the librarians and their IT practices. What became central were hidden landscapes inside the organisations they were employed at. Landscapes that both provided a possibility as well as an obstacle. What ANTa offered was sensitivity to things that do not always work smoothly, moments that are full of contradictions, places of resistance. At the same time, things were working in some ways. The librarians had gained access to computer servers, training in how to use html editors, funding was fixed, and web pages were being created. Their work was simultaneously about smoothness and resistance, difficulties and possibilities, a mixture of new and old organisational landscapes.

How is it possible to write scientific stories containing all these resistances, difficulties as well as possibilities? Can one scientific ANT story be both smooth and rough at the same time? How can one build in more dimensions in a one-dimensional medium? How can one write a story that is both closed and open? Are words and texts alone sufficient for this kind of writing? Catharina Landström writes in the introductory chapter of her doctoral dissertation about her writing vision and dream. She takes her metaphors from a computer canvas with moving figures and clickable images: "Viewing the book as a collage helps to sort out its aims. Especially if it is thought of as a computerised projection. There would then be a textured canvas. The texture would be made out of questions about how one can write science in ways that emphasise the ordinary rather than the revolutionary, relations in space rather than the progression in time and science as work rather than text. The textured canvas of the computerised collage would be delineated by a frame made of actor-network theory and feminist post-structuralist ideas. The background is multicoloured, with every colour expressing a specific line of questioning about agency, order, locals and globals in present-day molecular biology. In the foreground, there are clickable images. When clicked, some

of these turn out to be short movie sequences, displaying episodes of routine work in a molecular biology laboratory. Other images turn into more detailed stills, capturing projections of how particular activities and places can be ordered. All the clicking is done by a figure who decides which images should be activated and in what orders, it moves from one image to the next and, when they "run" it enters them as the narrator and analyst, carrying with it a tool kit of concepts which, at the same time as they are used to create order, are also reconfigurated." (Landström, 1998b, p. 1).

Stories together can be contradictory and incoherent. Both smooth and rough. How is it possible to write in tensions without becoming "overwhelmed by the complexities"? (Law, 1998, p. 102). How can one tell a "both, and, neither, nor story"? (Haraway, 2000, p. 172). The story telling gets finished because the storyteller finishes it; but the stories might have been more numerous and otherwise. What should be discussed is how our presentations support our conscious epistemological standpoints. This does not mean that the form of the story is of secondary importance. Technoscientific stories are often represented as written texts. The questions about the form and the epistemology run parallel to one another and are intertwined.

I have stressed the notions of story and storytelling because "understanding the world is about living inside stories. There is no place to be in the world outside the stories. And these stories are literalized in these objects. Or better, objects are frozen stories…" (Haraway, 2000, p. 207).

Concluding Discussion

Information technology seems to be both an amoeba and a chameleon. One minute it is a very pure and complicated technical story told by technicians. The next minute it changes and turns out to be a financial story told by business people. It subsequently turns out to be an educational story told by teachers. It is also, however, a household story told by computer people.

I am finally beginning to understand where my own confusion has its origins. What I desire are clearly defined boundaries. I want dichotomies such as nature/culture, human being/animal, human being/machine, woman/man, technical/non-technical. By saying "I want" I do not refer to some biological or essential need inside me, but to the way we have built up our epistemologies, universities, research institutes, professions and our lives. In short, the ways we have learned to tackle all aspects of our modern, western civilisation.

But slowly monsters are growing among us. Bruno Latour started to talk about 'technoscience' (Latour, 1999, pp. 174-175). The feminist post-structuralists transformed this notion as a means of indicating how science and technology have become intertwined. In Donna Haraway's words: "Technoscience extravagantly exceeds the distinction between science and technology, as well those between nature and society, subjects and objects, and the natural and the artifactual that structured the imaginary time called modernity." (Haraway, 1997, p. 3). What is more important than seeing science and technology as separate elements or forcibly trying to keep them apart from each other is to see the connections, interactions and impure coalitions between them. We get hybrids and we get cyborgs (see Haraway, 1991, Landström, 1998b, Mörtberg, 2000). Donna Haraway tells us that the cyborgs are born "from the force of the implosion of the natural and artificial, nature and culture, subject and object, machine and organic body, money and lives, narrative and reality." (Haraway, 1997, p. 14).

What actually happened to me one morning on my way to the university was that I suddenly realised that information technology is impure, it is a hybrid, a cyborg in itself. We already have hybrids among us, namely 'engineer-sociologists' (Callon, 1990, p. 83), the ones whom Michel Callon introduces when telling us about the French project which aimed to develop the electrical vehicle (VEL). At first sight, the VEL project seems to be very technical, demanding a huge number of innovations and involving a vast number of engineers and other technical personnel. Of course, this picture is true but it is not the only one. Before starting the technical part of the project, the engineers needed to convince both the political and other public actors that society in the future will need this new kind of electrical vehicle. They described developments in France, including the environmental issues, consumption behaviour and spatial planning of French cities. Their stories were told so that they became fully integrated with the very idea of the VEL. So the engineers became 'engineer-sociologists'. This is exactly what we see when talking about information technology. We see politicians describing the technical development, we find technicians who describe the future of society. Perhaps without being conscious of this at an analytical or theoretical level, they are the hybrids. Without these hybrids information technology cannot really be created, shaped and done simply because information technology is neither a technical nor a social issue but a fusion of the two. I believe by appreciating that if we do limit ourselves to being pure engineers, pure economists, pure teachers, or pure librarians, we can start talking about information technology – or more precisely, about information technologies plural – in a new way.

What I have been looking for some time are pure forms and clear boundaries because I am not trained to talk about hybrids. But the more I see of what the librarians in my examples are doing, the more convinced I become that they are shaping both 'the social' and 'the technological' perspectives. By saying this, I am also aware of layers in information technology that are extremely complicated technically. But I also know that information technology can be extremely simple on a technical level. I see that information technology becomes alive when it is used, as use is closely integrated with our ordinary everyday lives and with ordinary everyday activities.

By being ready to consider information technology as a hybrid, we open up new possibilities. By possibilities I mean that if we accept that information technology is not one, singular issue but rather a plurality of information technologies we must reconsider many of our definitions. As I have shown in some of the examples in this text, we tend to limit ourselves to talking about purely technical educational programs and professions. In hybridising the concept of information technology, however, we must also redefine IT education and professions. We have talked about other professions in the past but have defined these as users. Is this separation really necessary? If we are

ready to broaden the fields of IT education and professions to include teachers, journalists, nurses and librarians (to take but a few examples), we can progress further in our redefinitions. We create new experts and expertises. We produce new perspectives on inclusions and exclusions. In short, instead of thinking in terms of strict categories, often isolated and separated from one another, it would be possible to understand information technology as a line, a circle or a continuum, where the political 'doing' of information technology, the training courses given by librarians, software development by software engineers and so on would also equally constitute information technology and be equally dependent on one other.

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Chapter 3. Negotiating Information Technology: Politics and Practices of Public Sector Web Production[1]

Background

I am investigating information technology understandings, interpretations and translations in the public sector. My original point of interest was the daily work on the local grassroots level in a number of Swedish municipalities. The focus of the research was to study the co-operation between the technical staff at the IT-departments and the administrative personnel working with the daily production of web-based information. A rather straightforward and explicit perspective following participatory design ideas and experiences, namely the relations between the designers and the users. (See e. g. Clement & Besselaar, 1993, Kensing & Blomberg, 1998, Schuler & Namioka, 1993).

At quite an early stage, when doing interviews with the local practitioners, it became evident that the interview material did not actually focus on the relations between the designers and the users. Perhaps this indicates that especially when working with web productions the boundaries between the designers and the users are not that firm and clear and the place and function of the user is becoming increasingly blurred: "As they [information technologies] move from the realm of experts into the workplace and mingle much more intimately with other activities, the idea of computer expertise and the boundaries between developers and users are questioned…" (Markussen, 1996). But there seemed to be other lines of explanation available, too.

In the interviews, there were people, machines, interactions, places, memories and experiences all interacting and intertwining. The question that arose was: How should one take care of all the different elements and bring them together into one analysis and one story of local information technology practices? How could one find a method for analysis that would support the gathering of computers, people and practices together and encompass all the elements involved in the stories told by the practitioners?

The French sociologist Michel Callon has studied a project that set out to develop an electrical vehicle (VEL) in France in the 1970s. A government agency, fuel cells, city councils, engineers, cars, money and negotiations were acting and interacting in this development project. All the elements participated actively in the project, hesitated, acted out given roles and resisted (Callon, 1986). The ideas Callon implemented in his study were developed further during the 1980s to Actor-Network Theory (ANT). The ANT perspective seemed to provide inspiring analytical tools and vocabulary that encourage to think about co-operation as ongoing networking, with different human and non-human elements negotiating in order to realise their common goals (Elovaara, 2001). Since the focus in the interviews I worked on was on the relations between the human actors, developer-design, there was indeed a need to find methods of analysis and interpretation for the hybrid landscape of actors.

[1] Published in Binder, T. & Gregory. J. & Wagner, I. (Eds.) (2002) PDC 2002: Proceedings of the Participatory Design Conference, Malmö 23-25 June 2002 (pp. 306-310). Palo Alto, CA: Computer Professionals for Social Responsibility

If the process of web production was a mixture of extremely diverse elements, the next question was how fruitful it would be to expand the notion of design to embrace a wider network of negotiations and actors. Joan Greenbaum and Dagny Stuedahl, who have studied design and development of commercial web sites, have implemented the ANT perspective of negotiations and interaction between human and non-human actors in their own analytical work: "Through a focus on negotiations between actors, and the translations and transformations needed to end up in a delivered product, we found it particularly useful for helping us to identify intermediary moments in time and place where designs, specifications and software code were changed through actions by people, prior events and pieces of the technical infrastructure (non human interventions)." (Greenbaum & Stuedahl, 2000, p. 71). Inspired by the ANT-perspective, I have tried to be sensitive when thinking about actors, not only limiting them to people and their internal relations, but bringing together humans and a varying number of non-human actors.

The second issue I also became more and more conscious about was that public-sector information technology is not a one-layered phenomenaon, and it definitely does not exist in an isolated municipal vacuum. Johannes Gärtner and Ina Wagner talk about three different kinds of parallel arenas in the context of system design and participation (Gärtner & Wagner, 1996). According to them, there are different actor spaces involved in every design project. They use the notion of arena A when they talk about designing work and systems at the local level. Arena B is the space for organisational frameworks. The third arena C is the political arena. The important element here is remembering that these arenas exist in parallel and influence each other. However, they do not form a hierarchic pyramid, where the traffic (read: control, steering, resources, etc.) is always and necessarily from the top down. Of course, if there are, for example, changes in the legislation system and funding opportunities, these changes will influence the activities as far down as the local level. However, the local level has an opportunity for its own implementations and interpretations, and perhaps Arena A is also a space for resistance or re-negotiation of the ideas developed and worked out in arenas B and C. It might be useful to regard the three parallel arenas as having a character of layers rather than as independent and separate levels, also in the context of IT practices, and this might also allow the local actors more independence and power. If we implement the idea of parallel arenas, we can also understand the local IT practices as negotiations and translations, or perhaps negotiative translations.

In my research context, I have identified three parallel arenas following the thought lines of Gärtner and Wagner. I call these three arenas: national politics, local politics and local practices. In this paper, I will present some of the main themes and findings from each of the arenas.

In the concluding discussion, I will reflect how the idea of arenas and the ANT perspective can influence the analysis of the processes connected to municipal web production practices. Would it be possible to think about the web design as a network containing a chain of negotiations? How do the national and local intertwine with

each other? Can arena thinking together with the ANT perspective help us to cover and understand the complexity of the everyday IT practices?

Arena C National politics

One of the key texts formulating and articulating the dominating national understanding of information technology in Sweden is the government bill "Ett informationssamhälle för alla" [Information Society for All] (hereinafter: GB), proposition number 1999/2000:86 (Regeringens proposition 1999/2000:86). It was delivered by the government to the parliament on 28 March 2000 and was signed by Göran Persson, the Prime Minister of Sweden. The document contains 271 pages, including thirteen appendixes. A government proposition is a link in the Swedish legislative chain, which means that a proposition is a proposal for legislating new laws or changing already existing laws. The proposition in question is no exception. The bill incorporates changes to two laws in order to make it possible to draw network cables in connection with building the physical infrastructure of broadband. It also consolidates the position of home as a working place equal to an office, in connection with distance working. In addition to these legislative parts, the bill is the official governmental articulation of the goals and direction of IT politics in Sweden.

From a perspective of trying to see the shapes and contents of information technology activities in Sweden in the beginning of 2002, the bill provides four main themes of interest.

Theme 1 Hubris/ being best or at least among the best

One of the themes that seems to be very central in the text is an to understanding that information technology is a competition between nations, where it is of great importance that Sweden is either the leader or at least among the leading nations.

> *"Sweden is among the leading nations in the world in terms of the number of telephone connections, mobile phones, computers and subscriptions to Internet per inhabitant." (GB, p. 14).*

> *"Here [the use of Internet over the mobile network] Sweden is of the absolute world class. This is good news and means that Sweden even henceforth can be among the leading nations when talking about the IT development" (GB, p. 14)*

> *"Some of the largest IT and telecommunication companies have recently chosen to locate their research intensive activities to Sweden."(GB, p. 14)*

> *"[in a global analysis of the development of the information society] Sweden is not only the leading nation in the world but has also passed the USA as an IT nation." (GB, p. 15)*

This theme is the umbrella theme where the landscape of necessity and importance is shaped. There is hardly any space for negotiations concerning 'whether' information technology in the arena of the nation and society is important. The bill states quite explicitly that information technology is the issue that will promote the welfare of the nation and place us among the leading nations in the world.

Theme 2 The loving and caring state

Parallel to the layer of competition between the nations, the bill very strongly reflects, reproduces and strengthens the idea of the state that takes care of its citizens, like parents who know what is best for their children. This has been the ruling social democratic ideology in Sweden since the Second World War and is known as 'folkhemmet' [the people's home]. The main characteristic of this 'folkhemmet'-ideology (Hansson, 1935) has been to build up a strong welfare system that guarantees social benefits, such as child care, health care and school education, for every member of society. No one should be excluded due to her/his socio-economic situation. Of course, sometimes there might be gaps, for example in terms of access to information technology, and it is in exactly these kinds of situations that the state has a function to fulfil.

> *"Tendencies that indicate that there are gaps if we look at the use of technology among different groups are serious." (GB, p. 16).*

The same societal hug is also warm and inclusive when the bill talks about the gaps between men and women, people living in urban surroundings and in sparsely populated areas, people with low incomes and immigrants and their tendency to use information technology less than other groups in society. (GB, p. 16)

Theme 3 The caring and loving state is changing

Put in simplified and quite rough terms, the traditional ideology of the Swedish welfare state is based on a view that regards the citizens as a collective. Therefore also the services the state provides are based on an ideology that does not support individual choices. Another basic principle has been the idea of the strong state and the strong public sector. The bill in question still supports the basic ideologies of the welfare state, but also contains signs of change. One of these perspective changes is putting the individual citizen in focus and stressing the active role of citizens in developing the democratic functions of the state:

> *"The development of the Internet opens up new possibilities for public control and dialogue, direct democracy and control by the citizens. The dialogue on these [virtual] arenas can change the possibility of the citizens to gain influence…" (GB, p. 18).*

Citizenship is no longer a question of being a passive receiver of the public services, but demands both being responsible for one's own choices and activating one's own opinions, claims and wishes. What the citizen can do is to control more directly the functions, decisions and directions of the state. The bill also opens up space for other actors to enter the public sphere. The state invites private and commercial actors to cooperate and collaborate with the public sector actors. The bill has several paragraphs that both discuss and provide visions for further development of the IT industrial sectors (see e.g. GB, p. 66). The bill also includes the decision that the state owned

telecom company 'Telia' is going to be introduced on the stock market and that the government will decrease its ownership of the company (see GB, p. 129). The private sector influence is also strong when the bill discusses the issues of infrastructure, especially the development of broadband:

> *"Households and industry should during the next years get access to IT infrastructure with a high capacity of data transmission. This should primarily be implemented by the private sector." (GB, p. 70)*

Theme 4 Everybody and everywhere: invitation/straitjacket

> *"The transition to the information society will inevitably cause great changes both in everyday life and in working life." (GB, p. 16).*
>
> *"Everyone should have a competency that makes it possible to make use of information technology and have physical as well as economic access to the computer net with a high transmission capacity." (GB, p. 23).*
>
> *"The IT politics is not basically technical but a democratic project that is about providing all people access to the possibilities of the new technology." (GB, p. 23).*
>
> *"The IT political goal is that Sweden as the first nation will be an information society for everyone." (GB, p. 24).*
>
> *"The fundament for the IT politics of the future is the insight of the great impact of IT in all sectors. The development of the IT sector and the use of the new technology creates possibilities for economic growth, expanding welfare, increased knowledge and deeper democracy." (GB, p. 23).*
>
> *"The governmental goal for the coming years is that IT politics in an essential degree will contribute to an expanding fulfilment of the political goals mentioned above [sound state finances, stable prices, economic growth, low unemployment, more employment opportunities, so that Sweden will be the leading knowledge nation and a prominent research nation, to strengthen security, justice and welfare; to be able to hand over to the next generation a society that has solved the main environmental problems; so that the whole country will grow in prosperity, to reach larger participation in the democratic process as well as security and law and order]" (GB, p. 25).*

The official governmental direction for the IT-politics includes eight main sectors where the goal is to promote economic growth, employment, regional development, democracy and justice, quality of life, gender equality and equality in general, an effective public sector and a sustainable society (GB, p. 26). These inclusive thoughts integrated with the idea of the loving and caring state can be interpreted in at least two contradictory ways. Either this bill is an honest invitation to all of us to join the information society and realise the overwhelming and totalitarian changes in the society, or it can also be understood as stating that you are included, like it or not; there is no place for resistance or hesitation. You are in; do not ask any questions. It can be claimed that the bill describes information technology both as a technical and socio-political straitjacket.

Keylines

One way of understanding the national arena of information technology is to regard it as a dominating discourse. The dominating discourse articulated in the government bill reinforces an understanding of discourse as "regulated, methodically organised discussion which dictates what may be said or done, and what may not be said or done". (Johansson & Sturesson & Nissen, 1998). A discourse defines both values and the world. "The dominating, prevailing and predominant [discourses] are created by what is taken for granted and regarded as normal" (Mörtberg 1997). Discourses are born and brought to life in public texts and speeches. In other words, language and words are both the source and channel of a discourse that describes our way of relating to a phenomenon or event. Discourse also shapes, and is shaped by, different practices, which presuppose actors and action.

The government bill implies a strong IT discourse. It is strong because it is a hybrid. It is a hybrid because it, in a very fuzzy manner, blends technology and society. Many of the citizens feel included, because there seems to be space for a wide audience. The IT discourse as presented in the government bill is strong also because it mixes or integrates elements from other strong discourses in Swedish society. It combines the dominating gender equality discourse, the 'folkhem'- discourse, the new market economy discourse, the official environmental discourse and finally, the dominating discourse of technology that regards technology as the key factor for the prosperity of societies.

Arena B Local politics

On 31 May 2000, the local council in a medium-sized Swedish town accepted a document with the title 'The IT vision for the municipality' (hereinafter ITV). The document consists of seventeen pages divided into six chapters.

Theme 1 The good town

There is a strong focus on developing a municipality that is attractive for both its citizens and its industries. In the good town, the focus is on the citizens. The story told by the IT vision is as follows: 'The municipality is 'open'. Its services are easy to access, and accessibility is not dependent on time or space. The municipality wants to communicate with its citizens and will listen to and study their opinions. The municipality is attractive also for its industries; a well-equipped infrastructure will act as a tempting factor. The town is a good place for everybody to live in; it will take care of the disabled and women. The good town is inhabited by active citizens. All the partners,: the municipality, the industries, the educational system, have reached a mutual agreement when talking about the importance of information technology for the future development.' (ITV, pp. 1-17).

"Information technology can be used to make the municipality even more attractive and thereby becoming 'a municipality of the future'." (ITV, p.1)

"Information technology will support the citizens' rights to have an overview over the municipal activities and make it easier to get access to the municipal services." (ITV, p. 1)

"Through the increased use of information technology, it is possible to create better conditions for the disabled. Information technology can contribute to increased gender equality through competency development and by providing increased access to information." (ITV, p. 1)

"The conditions for the development of industries will, in the future, in an increasing degree be decided by the possibilities provided by information technology." (ITV, p. 1)

"The use of IT will contribute to deepening democracy, because IT through the possibilities on the Internet can remove the practical obstacles between the politicians and the citizens." (ITV, p.7)

"With the help of the new technology…new possibilities can be created so that the citizens can be informed and participate." (ITV, p. 7)

In building up this good town, the municipality also gets classified as a strong and developing municipality not only in the Swedish regional and national contexts, but also in an international context.

> *"…the vision of the municipality as the leading IT region…." (ITV, p. 2)*
>
> *"To be one of the most attractive municipalities for localising, initiating and carrying on companies." (ITV, p. 11)*
>
> *"To retain out position as one of the world's leading regions for the telecommunication sector." (ITV, p. 11)*

Theme 2 The effective town

Beyond the construction of the good and attractive town to live and work in, lie other threads. Information technology demands or creates possibilities for efficiency, control, steering and follow up. These thoughts can be recognised both when the vision document translates the visions into everyday organisational practices and when it talks about the development of the good town. The document refreshes the ideas and visions from the 1970s of automatisation and computerisation connected to rationalisation and efficiency (see e. g. Göranzon, 1992). The document aims to develop clear goals for the administrative practices by introducing ideas of documented goals, control points and steering. A digitalised version of taylorism, perhaps.

"Get value for money – the municipal activities should be cost effective and should bear the stamp of sound economy for the citizens of today as well as the citizens of tomorrow." (ITV, p. 6)

"…it is of strategic value to develop and install an IT system that supports the core functions of the municipality, which will increase the efficiency of and accessibility to the administration." (ITV, p. 6)

"A number of organisational changes have already been applied in order to increase efficiency and to decrease the costs." (ITV, p. 8)

"…relieving the pressure on the administration [because the citizens can contact the municipality via the Internet] means that there will be more time left for the core functions. It means also that there is a possibility for increased engagement and for a larger number of people to make contributions to solving problems." (ITV, p. 12)

"Besides improving the internal efficiency, it is of importance to change the external efficiency. Through developing and simplifying the benefit and the contacts with the municipal administration." (ITV, p. 2)

"The function that presumably will provide the greatest immediate profit for both the municipality and the citizens is the effective administration of municipal issues and questions. By providing the possibility of self-service through the Internet, the internal administrative work can be made more efficient and provide better services for the citizens." (ITV, p. 14)

Keylines

If we compare the government bill discussed earlier in this article with this municipal document, it is quite apparent that they are talking the same language. Both stress the further development of the Swedish welfare society based on the loving and caring public sector. Both documents also make it explicit that the welfare society is changing. The public sector will demand active citizens in the future. Citizens, who know what they want regarding public services. In this process, information technology will be one of the main channels for interaction and communication between the public sector and the citizens. Information technology will also be the space where public services designed for active citizens will be available.

The municipal document articulates high hopes concerning the development of the future promising a good living environment, greater democracy and an equal society. These visions are not new; they are the central part of the governing ideology of the Swedish version of the welfare state. What is new is that these ideas are embedded in a new technology. Have the old ways of working and acting become tired and worn, so that information technology is needed as a revitalising injection?

Nor is the idea of the efficient and cost-effective administration new, not even when talking about how computerisation can be the key factor to save money and time. What might be new is that the dreams of cost and time efficiency are embedded in and motivated by the dreams of an increased service level in the public sector and an active citizenship.

Arena A Local Practices

On 3 May 2000, I interviewed one of the persons working on with the IT-development in the municipality whose vision document I discussed in the previous chapter. The person I discussed with works mainly on the development of the municipality's web site, which means that the focus of the interview was on the Internet and the web site.

Following the procedure from the governmental and municipal texts, I have thematised John's web talk.

Theme 1 People

The central issue in John's statements about the web is people and the co-operation (or lack thereof) between them. What this indicates is that he places great value and importance on the human relations involved in everyday IT -work. In John's talk, a number of people with different positions and attitudes are mixed. He presents different categories of people involved in one or another way in the web production.

First, there are the enthusiasts who have visions and who initiate and encourage ways to find new solutions – both concerning both purely technical questions, such as software and database structures, and organisational changes. The real enthusiast in this specific case is characterised by John as follows:

> *"He had competency in both IT and organisational development. He had sketched how to tear down the borders. How to pee into the administrative borders. A tool to tear down the borders."*

According to John, behind the enthusiasts there are the people who criticise or at least do not actively support the ideas of the visionaries. In the actual case in hand, it was often the politicians who played this role. John says that:

> *"Yes they [the politicians] do care. But they care afterwards. When they are not satisfied they care. But they do not care in advance."*

To the same group belong people inside the organisation who are, for one reason or another, uninterested and who therefore might become the slow-downers, or as John puts it:

> *"There is a push inside the organisation at the same time when there is resistance in other parts of the organisation."*

Somewhere in between of the two groups, there is the group of people we might call cleaners or fixers. They are the ones who try to pick up the pieces when there is a lack of money, delays in software deliveries and uncommitted fellow workers:

> *"[John has been talking about missed deadlines and complicated situation in terms of people and software when he starts to talk about one particular person] who had to jump in and take responsibilities towards the politicians…so he had to jump in and take over keeping the project alive and seeing that it's functioning and that it develops and continues…"*

And John adds:

> *"I was given four weeks to find a new publishing system and was made responsible for the installation. It was impossible, actually….She [now he talks about a woman employed at the municipality] worked like a dog, night and day."*

Theme 2 The boundary object

John's story is a story about frictions, what happens when the partners involved cannot agree by negotiating upon a picture of the web that is 'enough of the same' for everybody. Bowker and Star use the concept of the boundary object and write: "boundary objects are objects that both inhabit several communities of practice and satisfy the informational requirements of each of them." (Bowker & Star, 1999). The idea is that this shared common agreement could then support the further decision making and web development in the everyday practices. John explicitly says that:

> *"They…have a picture. Those of us working with the reality have another picture. These pictures have never met."*

The following negotiating partners are involved in John's talk: the structure and the content of the web:

> *"For example, what kind of menus we will have and who is allowed to be there and to be visible…There was a fundamental shortcoming in the structure from the beginning. Namely, that we had used the administrative structure of the municipality as the starting point [on the web site]…There were many about-turnsroundabouts. The structure was re-designed. There was internal dissatisfaction: 'People don't find me'….and so on and so on…. Never ending discussions."*

One negotiating partner is the visionary ideas of the Internet understood as a place for democratic dialogue and a 24-hour service provider:

> *"We don't have any money to develop the 24-hour authority [the official Swedish term for providing electronic public services for citizens], to provide interactive services, such as registering in a queue for a place in a day-care centre …The Place for Democracy…we don't have enough money to do anything…"*

The third negotiating partner is technology, as represented by the software companies and the software. Citing John:

> *"We had to find a tool that supported our thoughts [of a decentralised means of updating the web site]. There wasn't anything that was ready….And then we found a local company that had an embryo. It was far from being a final version and it was not designed for the public sector. It was a dialogue. We were in and helped develop ited. We had requirements regarding the interface and the functions…Later on, Nick [the visionary] started to consider the possibility of to putting the Internet and the intranet together with a publishing system. To build up one single platform. There were no tools that supported these kinds of ideas. Then we again found a company that had an embryo. They [the company] painted pictures, but it wasn't finishedready. But it supported our idea of functionality and the way of working. .. It was cool. It was what we were looking for….But they couldn't deliver. There was no functionality."*

Theme 3 Time

Time is an issue in John's talk. On the one hand, he refers to the municipal idea of being many steps ahead of the others, but he also states quite disparagingly that:

> *"instead of being years ahead of the others we are actually several years behind."*

Here his time line contradicts the visionary words of being first out and being best, as we have identified and recognised in the vision document.

John is very preoccupied with action plans, delivery times and deadlines in general. This is of course part of the time ideology connected to information technology. But where the official information technology time is rapid, fast and non-problematic, in John's talk time becomes an obstacle, a friction, a huge problem, which he and his fellow workers have to work with and fight against. There is also the time before, the period of hatching and realising ideas, and the time afterwards, when things do not go as planned and when criticisms are articulated.

Keylines

John is one of the people at the grass roots level whose task is to translate the IT-visions into reality and functional services. What John's talk indicates is that the translation work is not only about adopting the computer-based tools and installing hardware and software. The core in his talk refers to various kinds of meetings: the old organisations and routines trying to meet the new ways of working and transgressing the existing organisational borders. People meeting software. Employees meeting politicians. Everyday reality meeting visions. And so on. John's talk leads us back to the description in the government bill:

> *"It is important to understand that IT and the information society are not only an integration of computers, media technology and telecommunication systems in a narrow technical sense, but also a sociotechnical system where the different forms of ownership, organisation and the regulative system in a high degree determine the development." (GB, p. 14)*

and where John would add 'human relations, negotiations, contradictions, friction…'

Discussion

It seems that arena C is stable in the sense that the space for negotiations is closed. There is at least one reasonable explanation for to this: my channel to arena C, national politics, but which also can be labelled as the dominating discourse of information technology. At the moment a discourse reaches the stage of articulation and publication – in my example as the government bill – it gets closed and the period of negotiations is over. The government bill is a product of the dominating IT discourse in Sweden and it keeps on reproducing and strengthening it. One clear indication of the strength of the dominating discourse is that it is not only produced and reproduced at the national level, but just as explicitly and synonymously at the municipal level, as in my case study.

When we move to the grassroots level, arena A, the ingredients of the story change. The processes and practices are getting messy, heterogeneous, and thereby complex. If arenas B and C could be described as stable, then it is instability that dominates the story told by John, the local web developer. In the everyday work, both stability and instability co-exist. The municipality's web site gets made and is being updated. Beyond this functioning stable layer, there are a lot of actors and their negotiations making the stability shaky and vulnerable.

This is exactly what the web production in this municipal organisation is all about. How to achieve stability when there are so many unstable elements involved? Many of the elements that John has identified are more or less invisible in the official web process, because they are not considered as at the core of the account of the local information technology activities and processes. The elements of time, software and politics are only 'present by being absent.' [2]

What is obvious after reading the texts and interviewing John is that designing information technology (in my case dressed as web production) is about much more than simply designing a web site. They are designing society, the municipality, the organisational relations, the boundaries between the public and private sectors, the relations between the citizens and the administrations, and their work. This might perhaps help us to understand the complexity of the everyday life of information technology, but one question still remains: How to bring the different elements more explicitly to design processes? Or is there a risk that we will lose ourselves in a jungle of too many actors, negotiations and networks?

[2] To find more about stable and /unstable element (in networks) see Law, J. & Mol, A. (2000)

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Chapter 4. Making e-Government happen – Everyday co-development of services, citizenship and technology[1]

1. Introduction

According to the new eEurope 2005 Action Plan (European Commission) adopted by the Commission in May 2002, the goal for Europe is to provide its citizens with 'modern online public services' by the year of 2005. Proposed actions in order to reach this goal are development or extension of broadband connections, launching of an interoperability framework, continuing development of interactive public services and establishment of public Internet access points. Other important areas are e-services within culture and tourism and public procurement. These are the 'far-reaching commitments' that the member states in the European Union have agreed upon.

In Sweden, the Swedish Agency for Public Management (Statskontoret, 2000) is working on issues relating to democracy and public administration. Among other things, they provide support for the local and regional authorities in their development of e-government.

The ambition and goal for e-government in Sweden is to stay in the front line of the development, to achieve increased networking and a 'seamless' organization and one-stop procedure of handling an errand, and to facilitate citizens' participation in processes of decision-making within public administration. The slogan is 'one errand – one authority', which is supposed to be realized by 2005.

This, then, can be seen as the prevailing rhetorical, discursive context of the recent and on-going development within the e-government area in Europe, which also forms part of the coulisse for the practices described in our case studies. These examples take us from meta-level rhetoric to the shop-floor level, where 'the action' is supposed to take place. At the same time as the rhetoric moulds the concrete practices, the practices also may be seen as functioning as a mould for future development.

In everyday practices of e-government, services, citizenship/democracy and technology are designed, developed, configured, implemented and re-developed, by different actors, concurrently, continuously, and in interaction with each other. In everyday life, 'the web' is rather a boundary than a common object between these practices of design and development. Each group of actors – software developers, local designers, service providers, service-seeking citizens, politicians – seems to refer to 'the web' without

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Published in Aprague, Ralph H. Jr. (Ed) (2003) Proceedings of the 36th Annual Hawaii International Conference on System Sciences, [HICSS36], 6-9 January 2003, Big Island, Hawaii. Los Alamitos, California & Washington & Brussels & Tokyo: IEEE Computer Society.

much further reflection about their own versus other, alternative, perspectives held by other actors involved in the development of e-government. This tends to generate friction, frustration and feelings of helplessness rather than efficient IT support for public service provision, better services, and an expanded understanding of citizenship/democracy issues.

What started out as a way of making public service provision more efficient and effective, (Lenk & Traunmöller, 2002) implies in practice profoundly reconstructing public service provision. Internet-based 'One-Stop Shops', on-line forms, or the publication of information via the Internet, do not leave the character of the services provided, or the organizations that provide them, unchanged. With the implementation of new technologies, the relationship between governmental agents and citizens, and, consequently, the meaning of citizenship, changes as well. What starts – viewed from a meta-level – as the rationalization of government, at closer examination turns into co-operative design and development of technological infrastructure, service provision, public service, and, along with this, the re-construction of the very concept of citizenship itself.

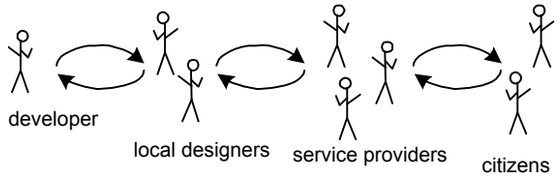

Figure 1

Figure 1 shows the simple picture we use to visualize complex, parallel, on-going, design-oriented interactions between some of the different actors involved. Design does not only take place in designated organizational spaces, but is also part of everyday implementation and use of technical infrastructures. As we will show with our field material, with different participants the focus and perspective on what is designed changes. The hypothesis we put forth in this article is that including the many different perspectives involved could improve both the quality of the process of developing e-government, and the successive outcome of this process.

In section 3, we turn to our research studies of how different interlaced discourses and practices of design take place and make e-government happen. We also show the frictions that occur and that call for tools and concepts to facilitate the interlacing of diverse design practices. Section 4 develops starting points in this direction.

In the following section, we introduce the perspective on design we all relate to, despite different disciplinary and theoretical backgrounds

2. Interlaced practices of design

Design is normally related with certain professional roles. In the context of information and communication technology, design is a practice mainly ascribed to computer scientists or information system professionals. The object of design is the technical

infrastructure that should support the users in their everyday work. If work practice is subject to design, and if users should participate, it is often the role of a participatory designer (Kensing & Blomberg, 1998) to take responsibility for the project versus the users, and mediate the use context for the software designers. The software designers themselves thus have little or no contact with the work practices for which they are expected to design supportive technology. Lucy Suchman describes this way of relating to and practicing design as 'design from nowhere'. 'This stance (…) is closely tied to the goal of construing technical systems as commodities that can be stabilized and cut loose from the sites of their production long enough to be exported en masse to the sites of their use.' (Suchman, 1994, p. 27).

Our fieldwork supports Suchman's claim that computer systems to a large extent resist commodification in this sense (Suchman, 1994, p. 27). If they are socially embedded, they not only support work and business practices that can be regarded as constant, they also change them. Design of business practices, organization, the development of different ways of working and the implementation of technology are dependent on each other. In regard to municipal information systems, the technical infrastructure, its adaptation to a specific organization, the further development of services and service provision with the help of the new technology, and, in consequence, the relation between citizens and public administration – and that means the concept of citizenship – changes. Different design practices with different foci and actors that are interrelated are taking place in parallel. How can we make sense of, and facilitate, the interlacing of different and diverse design practices?

Suchman proposes an alternative concept of design. Understanding design as artful integration of different social as well as technical contexts allows for taking working relations of technology production and use into consideration, rather than negating them. (Suchman, 1994, p. 22) 'Powerful technical systems on this view comprise not hegemonies but artful integrations. Design success rests on the extent and efficacy of our analysis of specific ecologies of devices and working practices, finding a place for our own technology within them.' (Suchman, 1994, p. 34) The figure we introduced above (Figure 1) shows part of the network of working relations that interact in what is called e-government. The different vignettes in the next section give concrete examples and explore parts of such networks. And they show examples of where things do not work out, where frictions and conflicts indicate lack of integration.

Suchman's change of perspective is rather a program than a conclusion. Today's methods and practices of design often do not take the different interdependencies into account. In the discussion section we bring together concepts and methodological approaches from different directions that we see as useful for facilitating the interlacing of the diversity of different design practices that comprise e-government.

3. Making e-government happen

Our fieldwork took place in different municipalities and with different underlying theoretical frameworks. Therefore, we have chosen to present and discuss our examples in the form of vignettes, that is, as episodes based on, as well as containing field

material from, our case studies of IT use and design in public service administration. In the diversity of the described practices of development of bits and pieces that are part of e-government, a common problem of co-operation in design becomes visible. There are no established, sustainable structures that facilitate and integrate the co-operative design of citizenship, services, service provision, and technical infrastructure when municipal services are moved on-line.

The first vignette, 'Reconfiguration of citizenship and relations', is written by Annelie Ekelin, who works with the research group 'Informatics and Work'.

The second vignette is written by Pirjo Elovaara. 'Who develops the municipal web-site?' highlights the on-going negotiation of stability to make the web happen. Pirjo is doing her research within the discipline of Technoscience Studies.

The third vignette, 'Cultivating organizational infrastructures', is by Sara Eriksén, who has a background in Informatics and Work Science. Sara takes a close look at on-going local design of IT in a one-stop shop.

The last vignette, 'Co-developing technical infrastructures' is written by Yvonne Dittrich and Christina Hansson, who are doing their research within Computer Science, with a main focus on use oriented design and development of software.

Despite our diverse disciplinary and project backgrounds, we use similar field study and analysis methods. We work with qualitative methods. We observe concrete work practices, sometimes documenting them on video or audiotape to allow for detailed interaction analysis. Open-ended interviews are taped and analyzed. Participatory design is both a goal we share in studying and working with the development of e-government, and a means to interact with our research partners around design, as it provides additional input for our analysis of both current situation and possible design.

3.1. Reconfiguring citizenship and relations

The process of reconfiguration (Woolgar, 1991, Mackay et. al, 2000) of relations by access to technologies and public services online is of importance for the ongoing renewal and modernization of the public sector. Reconfiguration of the communication between citizens, local employees and official authorities means, i.e. activities on defining, representing, restricting and controlling the dialogue as well as facilitating use. These changing conditions of communication, work and use of technologies (Suchman, 1994), have implications for the future enactment of citizenship. Access is important, but an equally important question to put is; access to what and by whom? Provision of public access also changes relations, due to shifting competencies, evolvement of new intermediary roles and also increased possibility for autonomy among citizens, (Grönlund, 2001), which the practical examples in this vignette will show.

The discourse regarding e-democracy and e-government prerequisites active citizenship and that access to new technology is a fundamental right for everyone. A view

of citizens as service recipients – rather than active participants – has hitherto been predominant within the European context (Grönlund, 2001, Anttiroiko, 2001). In the figure below (Figure 2), the 'normal' communication channels are highlighted, indicating the dialogue between service providers and citizens', 'furthest away in the food-chain' (or at least in the periphery of what traditionally is regarded as the core-business in software development) (Kensing & Blomberg, 1998, Dittrich & Eriksén & Hansson, 2002). The need for changes in communication and relations is acknowledged by both citizens and employees within public administration, illustrated by the practical examples in this vignette.

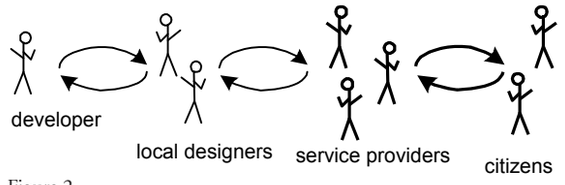

Figure 2

Two Canadian researchers, (Clement & Shade, 2000) working within community informatics, emphasize access as an intrinsiccally complex issue. They suggest a workable definition and method of defining a holistic view of the concept of 'universal access', a socio-technical model called 'the access rainbow'. This model expands the understanding of 'access' as being merely a question of creating physical connectivity to Internet-based information and services, acknowledging the complexity of the notion, by describing a multi-layered model (Clement & Shade, 2000, p. 40), comprising seven layers, including carriage and facilitates, devices, software tools, content and services, service and access provision, literacy and social facilitation, and finally governance. (Clement & Shade, 2000, p. 36)

Without denying the importance of everyone's 'right to have access', I would like to focus upon another phenomenon, which sometimes occurs as an additional attribute of a rainbow, namely the appearance of a 'fogbow'. This could be used as a metaphor for expanding the 'access rainbow model', and for discussing exclusion within the practice of inclusiveness.

A possible way to make this almost opaque, sometimes-visible phenomenon perceptible is by discussing access both in terms of exclusion and inclusion, addressing citizens as well as employees within the local authorities. By showing ways of exclusion in practice, experienced in ongoing service development in Sweden, the issue of access is further explored, in relation to everyday work practice as well as everyday use practice, in the following sections.

My first example, then, is about the cleaning lady and the public Internet monitor (PIM). During my fieldwork in connection with the evaluation of the PIM project (Ekelin, 2001), I by chance heard of a middle-aged immigrant woman, who worked at a library where a public Internet monitor had been installed. She had learned to use the terminal on her own, during lunch-breaks and whenever she felt she had the time

to explore the new device that had been placed in her working environment. She even introduced her children, relatives and friends to it. When management found out that she was using the terminal, she was stopped from doing so. She had to work her scheduled hours, and not conduct personal tasks during working hours. In this case, her work position as a cleaning lady was a hindrance for her to develop her autonomy. She had a job, and a work role, that traditionally does not support personal initiatives towards enhancing skills and personal development. When I interviewed the woman, she turned out to have valuable insights concerning the location of the terminal and the interface of the portal. Her insights and suggestions could have been of importance for future placement of the terminal, if there had been formal ways to gather such feedback.

The discourse on accessibility emphasizes that the services are provided 'all the clock around', at all times of the day and night. The example with the cleaning lady shows that there are invisible borders surrounding the 'access for all' vision, and makes visible the 'fogbow of access', the layer of 'exclusion within inclusiveness' as well as the mechanisms of reconfiguration of relations and access.

What happens, then, with the desirable increasing of autonomy for citizens, and stimulation of an active citizenship, if the right to have access turns out to be limited in reality due to restrictions in work practice, stating 'not during working hours'? Yet my first example ends on a hopeful note. The cleaning lady was not prepared to give up her recently acquired autonomy. She continued searching for public information and official services during lunch-breaks and after she had completed her work.

My second example could be titled How to create better interactivity–while ignoring actual user feedback. The national authorities had the intention of stimulating the local actors in establishing chains of anchoring activities concerning the PIM terminals, involving local authorities and 'local hosts' (basically, employees at libraries, one-stop shops, and local authority offices). This was unsuccessful in many places, due to lack of resources. Several hosts pointed out the need for extended possibilities to deliver feedback to the authorities, and the authorities pointed out the need of involving these actors in further development of the project, but in reality there were no plans on developing processes for active incorporation of users' feedback.

The local hosts and facilitators for the PIM projects' terminals were dealing directly with the phases of social facilitation and reconfiguration according to the access rainbow model (Clement & Shade, 2000). In actual practice, this means, for instance, giving extra support to marginalized groups, acting as mediators and assistant authorities, restricting the use by technical configurations, controlling the access by putting up hindrances for certain kind of groups (i.e. youngsters using the terminals for playing games, or individuals such as the cleaning lady). But they were not allowed to take active part in processes and activities of local tailoring and service design (Dittrich & Eriksén & Hansson, 2002), where they could have put forward opinions on functionality, gathered during the numerous sessions with the citizens:
'It would be marvelous if we could talk to some people in management on these issues. It is possible to develop further, because we gather opinions and information on possible improvements, but now no one knows who is responsible, and it takes such a long time before it reaches the right person, if it ever gets there.' (Host number 2)

3.2. Who develops the municipal web site?
The purpose of this second vignette is to explore everyday working relations (Suchman, 1994) when developing and providing on-line e-government services on the Internet. The empirical material is based on a pilot study from a medium sized Swedish municipality. The focus is the backstage work of the municipal web site as a precondition for providing and making municipal information and services accessible on the Internet.

The official political guidelines stratified by the Swedish government form an overall theme for all public information technology activities, both on a national and local (municipal) level. The latest government bill of information technology, titled 'Information Society for All'[2], was launched in March 2000 (Regeringens proposition 1999/2000:86). One of the main themes of the bill is the emphasis on efficient public governance. The national political documents, such as the actual government bill, play a dual role, forming a political landscape for the public sector IT development in Sweden. Besides pointing out the obligatory character of information technology, the political documents also show in what fields and in what direction the IT based services should be developed.

A political information technology strategy document, equivalent to the national political goal document described above, was accepted by a local city council during year 2000 in a medium sized Swedish municipality. If we compare the political goals articulated in the government bill, we can see that the local politicians formulate goals to a high degree identical to the national goals: emphasis of the importance of information technology for the competitiveness of the municipality as such, strengthening of the idea of the municipality as a deliverer of the public services of the welfare state (regional development, democracy, quality of life, gender equity, efficient public governance) and offering possibilities for/demanding an active participation of the citizens. Once again, we meet a manifestation of the importance of information technology as an arena for efficient public governance and a re-configuration of citizenship.

Everyday work is needed to translate the overall political visions of governance into concrete e-government services. The most common IT platform for this translation work is the Internet and its web based applications. In order to see what this translation work is about, I interviewed a web developer employed in the same municipality as where the strategy document was published. During the interview, I was especially interested in the following issues; 1) to see how the co-operation between him and the persons employed at the municipal IT department works 2) to see in what way the political goals get translated into concrete IT services, and 3) to see what other actors are involved in everyday IT work.

[2] In the Swedish original, "Ett informationssamhälle för alla",

B.4 In the following, I will present a thematic analysis of the interview material in order to connect the empirical analysis to my original questions of concern.

The most central issue in John's (the web developer) talk is people, and the existing and non-existing co-operation between them. He presents different categories of people involved in one or another way in the web production, but his categorization is not based on the idea of who is a technical expert, a system developer, and who is not. He talks about to what degree people around him, who in one or another way are involved in the web site development, are engaged in and committed to their work.

John's categories include enthusiasts, the critical ones, the uninterested or the slower-downers, and, finally, the 'fixers' or the 'cleaners'. The real enthusiast in this specific case is characterized by John as follows:
'He had competency of both IT and organizational development. He had sketched how to tear down the borders. How to pee into the administrative borders. A tool to tear down the borders.' [Here John is talking about the municipal IT strategy manager.]

In this actual case it is often the politicians who are the critical ones. John says:
'Yes they [the politicians] do care. But they care afterwards. When they are not satisfied they care. But they do not care before hand.'

To the same group belong the persons inside the organization who are, for one reason or another, uninterested, and who therefore might become the slower-downers, or, as John puts it:
'There is a push inside the organization at the same time as there is resistance in other parts of the organization' [Here he refers to persons having a role as web site publishers in different municipal departments, individuals who often get this assignment on top of all the other responsibilities they already have.]

The 'fixers' or the 'cleaners' are the ones who try to pick up the pieces when there is lack of money, delays of software deliveries, and uncommitted fellow workers:
'[John has been talking about the passed deadlines and complicated situations both considering persons and software, when he starts to talk about one particular person] who had to jump in and take responsibilities towards politicians…so he had to jump in and take care of keeping the project alive and seeing that it's functioning and that it develops and goes on… I was given four weeks to find a new publishing system and to be responsible for the installation. It was impossible, actually….She [now he talks about a woman employed at the municipality] worked like a dog, night and day.'

John does not only mention people as actors, but refers to various non-human actors, such as organizational issues:
'For example, what kind of menus we should have and who is allowed to be there and to be visible…There was a fundamental shortcoming in the structure from the beginning. Namely, that we had used the administrative structure of the municipality as the starting point [on the website]…There were many roundabouts. The structure was re-designed.

There was internal dissatisfaction: 'People can't find me…'.and so on and so on…. Never-ending discussions.'
…politics:
'We don´t have any money to develop the 24 hour authority [= the official Swedish term for providing electronic public services for citizens], to provide interactive services, such as queuing for a childcare place. …The Place for Democracy…we don't have any money to do anything…'
…software, co-operation with software companies:
'We had to find a tool that supported our ideas [of a decentralized version of updating the web site]. There wasn't anything that was ready-made…. And then we found a local company who had an embryo. It was far from the final version and it was not designed for the public sector. It was a dialogue. We took part and developed. We had requirements regarding the interface and the functions…Later on Nick [the visionary] started to consider the possibility of joining the Internet and the intranet with a publishing system. To build up one single platform. There were no tools that supported these kinds of ideas. Then we again found a company that had an embryo. They [=the company] presented pictures, but it wasn't ready. But it supported our idea of functionality and the way of working. … It was cool. It was what we were looking for…. But they couldn't deliver. There was no functionality.'
…and finally, the issue of time:
'instead of being years ahead of others, we are actually many years behind.' [Here John is skeptically referring to the IT political document and its goals.]

The fragments from John's everyday life show that in this specific case the main concern between different categories of skilled persons was much broader than just the relations between developers and users. Actually, the categories of developers and users were not that explicit in John's talk. There was actually no person with formal system development training involved in the web site development. And what about the users? At one level, the users were the persons updating the departmental web sites, but at another level the users are the citizens, totally absent today in the web site development.

John did not talk a lot about political goals. However, these are present, because they steer the content development of the web site. What was a politically hot topic during the time I interviewed John was how to use the Internet as a democratic arena where the local politicians and the citizens can interact and communicate. As John's talk shows, he was concerned about this, but what was politically an important issue was difficult to accomplish in everyday work. And of course the whole web site investment from the municipality is in itself a clear indication of it' political importance.

John's story is a story of a network where both humans and non-humans interact and intertwine. In John's talk, there might be specific reasons for this. The period during which I met John was characterized by turbulence. The municipality was looking for new software for the Internet activities, the actual web site was being criticized both by the local politicians and the mass media, the division of labor was under constant discussion, there were no clear decisions about the content of the web site, and many

of the key persons had left the municipality. It was, clearly, a period of uncertainty and instability.

One way to understand why there are so many problems is to consider the web site as a boundary object. (Bowker & Star, 1999). As long as the negotiations are not finished and the boundary object is not agreed, the web site work will continue to be a scene of disagreement and shadow activities. The core question is: How different can the visions of the web site be, and still allow the construction of a functional municipal web site?

3.3. Cultivating organizational infrastructures

One-stop shops, one of a variety of on-going forms of integrative organizing of public services, are a relatively new form of collocation and coordination of services in Swedish municipalities. Basically, they consist of an office where citizens are offered several different kinds of public services in one and the same location, often handled by one and the same person in a team of so-called generalists or public service guides. Although the reception desk is a central meeting place between the municipal administration and citizens/ other visitors in this environment, a large part of the service provision is actually carried out by telephone. The computer support for front-office work in one-stop shops has in recent years become more and more Internet-based and integrated with public services on-line as well as with intranet solutions within the local municipal administration.

The one-stop shop in central Sölvesborg, inaugurated in the spring of 1992, is one of the oldest municipal one-stop shops in Sweden. Here, in sequential case studies, we have been following the development of computer support for front-office work since 1995. A team of public service guides staff the one-stop shop, answering questions and helping out, either face-to-face, by phone, via e-mail or, in some cases, by internal or regular mail. The front-office team is responsible for keeping much of the municipal information on the Internet and the municipal intranet updated, and for the further development of public information and services on the municipal website. They are well acquainted with what kinds of information people ask for and need, and, as they use the Internet/intranet themselves all the time on the job, they are aware of design and accessibility issues.

Ten years ago, when the one-stop shop first opened, most of the applications accessible via the municipal network were mainframe systems, supplied by the main national dealer in software for municipal administration at that time. Today, the front office team uses the Internet/intranet, regularly accessing and using more than 20 different applications from almost as many different software providers. (This is not including all the more or less invisible middleware that keeps the network going. To get an approximate idea of the number of different programs they consciously work with on a day-to-day basis, we simply counted the program icons on their digital desktop, and checked that these were what they themselves perceive as the applications they use most regularly.)

When, during our field studies, we asked the team-leader and manager of the one-stop shop if we could talk to the people in the municipality who were responsible for the computer support – technicians and systems designers in some central IT department, we imagined – she answered spontaneously and almost indignantly 'The designers? That's us!'

Sensing our consternation and doubt, she explained by offering concrete examples. The first example concerned the decision process in the purchasing of a new computer system.

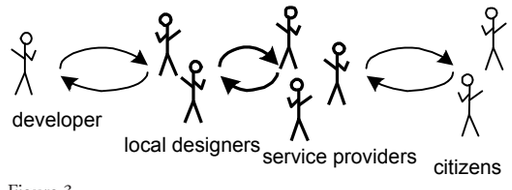

Figure 3

A few years ago, the municipality decided to invest in new computer support for the telephone exchange. In the purchasing process, the front office work team set up the main functional requirements and, in the end, made the final choice between different available systems. The municipal technicians gave them advice about technical aspects of the various systems offered, based on the overall IT strategy in the municipality, network capacity etc. The front office team has gained considerable experience during the past few years in specifying their needs and not only participating in, but also initiating and carrying through, the purchasing processes for necessary applications to further develop their computer support. At the level of analysing needs, exploring options and deciding on what new pieces to add to the puzzle of different applications in use, their claim of being 'the designers' seems indeed to have substance. In a broader sense, the fact that they are actively and continually involved in designing and developing the computer support for service provision, means that the front office work team is also deeply and daily involved in designing and developing public services.

The second example offered by the manager concerned software design, in this case the continual design in use of an Internet-based system for booking locales (tennis courts, conference rooms etc.). A small software consultancy firm in the region has developed this application. When asked what parts of the current computer support they find most useful, functional and well designed, this is the application the front office team uses as the best example. The consultancy firm keeps in contact with their customers, municipalities and associations all over Scandinavia, and provides support both via telephone, via their website on the Internet, and via visits. They have customer support meetings between 8 and 10 times a year, during which problems and new ideas are discussed, and suggested changes and further developments listed and prioritised. The processes of continual support, take-up on customer feedback and further design and development, which this firm cultivates, may well be a large part of the reason for their successful product. They produce approximately 15 – 20 new versions of their basic application per year. These are continually being provided to all

customers via the firm's website, with descriptions of 'what's new'. This allows their customers to choose for themselves whether the newest version is one they need to download or not, depending on what new functionalities have been added.

Through the customer feedback processes, there is apparently some substance to the Sölvesborg front office team's claim of being their own designers, even here. Admittedly, they represent only one of some 250 customers giving continual feedback about the product. However, it is clear that they themselves feel that they have been able to act as co-designers in the case of their most appreciated application, and that they still have a co-constructive role in its continued development.

Recent development in Sölvesborg has lead to the front office team earning a more official status in the organization as local designers of the municipality's intranet. They are now acting as consultants for other departments in how to use the existing possibilities, discussing and coordinating improvements.

However, the openly acknowledged role of local experts concerning the municipal Internet/intranet development and design, which the front-office team at the one-stop shop in Sölvesborg has earned in recent years, is still something of an exception, in our experience.

3.4. Co-developing technical infrastructures

In the spring of 1995, Ronneby, as one of the first municipalities in Sweden, launched its website on Internet. Since January 1999, the municipality has run its own intranet, with links to information on the public web. Routines are currently being introduced to allow all departments within the municipality to be responsible for publishing their own content and services. The idea is that the latest information will always be available on Internet for the citizens. This is a way to realize the Swedish Agency for Public Management vision of '24/7 agencies'. To make it possible for all departments to publish their own information and services, a publishing tool is needed which makes it easy for the departments to administrate their own part of the web-site. During our study, the municipality had chosen to successively implement Intrainfo, a platform for among other things an administrative application for Internet/intranet publishing.

The study focused on the development of a part of the platform called Intradok, a document-management system which contains templates, that is, sets of rules for writing, displaying and storing various types of digital documents within the municipal intranet and the public website. It became visible, how much the publishing tool and the organization of work practices around the provision of services condition each other. One can hardly be designed without knowing about the other. Preferably, technical infrastructure and the practices of service provision should actually take place hand in hand (Suchman, 1994).

As Ronneby municipality agreed on acting as a pilot customer for Intradok, Anna, a representative from the municipal information department, co-operated closely with Johan, a system developer from the software consultancy firm, around the design of

the application. Most of the cooperation was carried out by phone, supplemented by the use of pcAnywhere™, an application for accessing and temporarily taking over control of a local network-based PC application from afar.

We interviewed Anna and Johan and observed and video taped parts of their co-operative design sessions during 4 months. The following dialog is a translation of a part of such a development session. The purpose was to show Anna how to set up a new template for a specific set of documents, together with the related rules for access and editorial rights. At the same time as Anna is taught, she tests the tool and suggests changes and improvements. At one point, Anna recognizes that she cannot choose more than one responsible role for each template:
'OK', Anna says, 'has the role…, am I able to choose just one role?'
'Yes, you can'
Anna continues: 'I mean, am I able to choose several roles?'
'Hmm…no!!' (A pause of five seconds)
'Hmm,… why has nobody thought of that?' Johan answers.
'Make a note, Johan!' Anna says in a teasingly commanding tone, with a serious undertone.
Johan answers: 'You actually ought to be able to choose several departments as well.'

Anna follows this up by giving some concrete examples of when this might be necessary. Johan makes a note of it and promises to incorporate this feature in the next version of Intradok.

The session turned out to be a teaching and feed back session at the same time, where expertise shifted back and forth between them during this mutual learning process. Since Anna took an active part in the design of Intradok, she will be able to adapt the tool and templates on the basis of the municipal present and forthcoming needs. One of the main tasks of the information department is the customization and implementation of the tool into the organization. Anna designs the space for tailoring and customization that the tool will provide. The cited exchange shows how necessary the co-operative design was in order to develop an information system that supports organizational practices. This way of developing Intradok differs from the traditional way of developing software; it is not a 'design from nowhere' where 'anonymous and unlocatable designers (…) problematize the world in such a way as to make themselves indispensable to it and then discuss their obligation to intervene, in order to deliver technological solutions to equally decontextualized and consequently inlocatable 'users'.' (Suchman, 1994, p. 27). It rather relies on and responds to a working relationship with at least a few pilot users.

In parallel to our study of the co-operation between the consultant and the local developer, we studied the current practice around publishing vacant job advertisements. This part was carried out as workplace-studies and as a workshop focusing on the design of a common template and the related re-organization of work practices. Today, three secretaries construct and write their own job advertisements. They are responsible for different areas within the municipality. When the advertisement is

completed, it is sent by e-mail to Anna, who edits it and then publishes it on the Internet and/or the intranet. According to the declared policy, the secretaries in future will edit and publish the advertisements themselves with the help of Intradok. This also implies that their work practice will change and new routines have to be introduced. We arranged a half-day workshop around the current work practices and the anticipated change of technological support. All three secretaries have similar tasks and are located in the same corridor. Nonetheless, it turned out that they had almost never discussed their work among themselves. At the workshop, they got the possibility to do so, and to share their expectations concerning the new tool. When the differences in their work practices became visible in the discussion, they took a step back and reflected on their different ways of working. Towards the end of the workshop, the secretaries designed a proposal for a common template for job advertisements. Ideas and suggestions that were discussed at the workshop were summarized at the end of the day and passed on to the local developer, in order to feed back into the design process. Instead of establishing an enclosed site for developing the templates without participation and suggestions from end users, we brought out the development to the environment of the intended use of the templates. When development takes place in the intended environment, it can feed back into the design of the adaptation features and help to make them more adequate for local work practices. Also here, relations and interaction between development, local design, and use (Suchman, 1994) make things work out.

Both these examples of co-operative design show how the design of technical infrastructure and the development of work practices around municipal service provision influence each other.

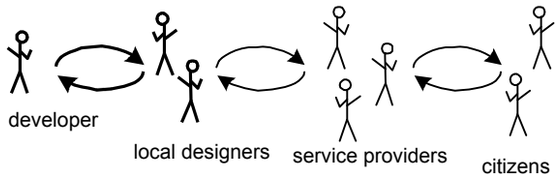

Figure 4

4. Towards sustainable structures for continual co-operation in design

The development of e-government in all reported cases does include the joint development of technical infrastructure, service provision, services and even what it means to be a citizen. There is no single or main developer or designer. Agency shifts over time, and depending on what aspect is in focus. Different actors in these interdependent design practices have different perspectives and different foci in their activity. No wonder, then, that the co-development of services, their provision and the technical infrastructure is not a smooth and simple process.

In the participatory design discourse, methods and tools have been developed to mediate co-operation between professionals that use software and developers. (Kensing & Blomberg, 1998, Clement & Besselaar, 1993, Schuler & Namioka, 1993). Can these methods be adapted and complemented to mediate complex co-operative processes as they became visible in all four cases that we reported above? What does it require to expand participatory design beyond software or other development projects?

4.1 Including the public

Looking back to Annelie's case, the question arises: Could the 'cleaning lady', using the PIM terminal, bring up valuable aspects on further development of the artifact – if she only had the possibility?

If a continual activity of joint co-development of services is included as a central part of co-development of services, citizenship and technology, this also blurs the boundaries between governmental and municipal authorities, private sector employees and other actors within, for example, the voluntary sector but most of all – the boundary between citizens and the local authorities. The citizens become key figures in the 'web of connections' (Suchman, 1994), that make up design, content as well as use of new technologies. This on-going intertwining and co-development of content, services and citizenship could be described as an essential part of creating an active citizenship, acknowledging the citizens and their experiences as a vital part in a continuous reconfiguration of relations and dialogue-models as well as articulation of citizenship.

In the discourse on participation in e-government, few reflections are made concerning the basic issue of the democratic values that could be gained by early involvement of local employees and citizens in developmental work or technology-based activities in the shape of local tailoring of technologies in settings of direct, and concrete importance for citizens, such as for instance the use of local public services in work places. Making more deliberate use of participatory design methods for incorporating multi-perspectives in service design as well as technology production and use could be an inclusive way to stimulate a broader, sustainable participation in local development of e-government.

4.2. Mapping out networks

Actor-Network Theory (Callon, 1986, Law & Mol, 2000, Elovaara, 2001) might provide a theoretical and functional framework for drawing a process map where as many actors as possible, even those not explicitly recognized in official plans and documents, could initially be identified. Parallel with this identification work, it would be necessary to follow how the process and the decisions during the process are made, and how the direction of the web site development is under ongoing reformulations. By drawing this map of the process network, insights could be gained as to where the critical points are, where the actual decisions are made, who is making these decisions, and where more resources and efforts should be put in. The surprising finding of the cartographical work might be that, besides the web site, other things (such as society and the municipal organization) are also being designed. (Gärtner & Wagner, 1996, pp. 187-214).

Certainly, in vignettes 3 and 4, we can see how the design of technology is an integrated part of the design and development of service provision, and of work practices around these.

4.3. Tailorable software

To support the continuous participatory development of public services and their provision by citizens and municipalities, the technical infrastructure has to be flexible enough to accommodate the developing requirements. It does not matter how well the system fits when introduced. The usage, the organization and the users undergo continual changes. The complexity of the contexts makes it difficult to predict all needs that might be important in the future. Computer systems have to be adapted to be able to meet the changed circumstances.

The tailorable design of computer applications is therefore of special importance. Tailoring can be seen as a continual development of a tool, a process that successively leads to a better tool for the users. (Mørch & Mehandjiev, 2000). This continual process of adjusting, tuning and improving should take place in the users' work environment and context.

Mørch and Mehandjiev (Mørch & Mehandjiev, 2000) talk about tailoring as co-operation between developers and users; co-operation that takes place over a long period of time. Users tailor the tool when work practices change. Tailoring starts during or directly after installation of the tool, or later, during use of the tool. The long-term aspects are important, because organizations undergo continual changes. The adaptations to the system mirror the developing needs of the organization. The way the system is adapted over time helps to better understand the needs when developing a new version. Also for this 'slow motion' co-operation in design, the understanding of the situation where the software is used deepens with the ongoing design of the application.

Such practices, on the other hand, require a long term and stable relationship between developers, local tailors and users. Continuity in co-operation has to be maintained; new developments of applications intertwine with use, maintenance, tailoring, adaptation and further development. Understanding software design as networks of decisions in relation to use, technical and development contexts (Floyd, 1992) can provide a starting point. Development tasks, design in use and use can be understood as parallel activities with shifting intensity and shifting main actors. Ways to coordinate and manage such patchworks of design activities, as we were able to observe in our case studies, are still to be developed.

4.4. Shop floor IT management

Continual and sustainable relations of co-operation are not just an issue of the co-operation between software developers and local designers. Including the different actors in suitable forms into the ongoing development requires sustainable structures of participation. For achieving good quality public service provision, it seems important that good practices of continual design should be deliberately nurtured and cultivated. (Dittrich & Eriksén & Hansson, 2002). An organizationally defined function and structure for 'shop floor IT management' (Eriksén, 1998) might be a way of making these design and development activities, and the multiple and shifting foci of design they represent, more visible and organizationally legitimate. Shop floor IT management we see as the everyday work of making IT work, that is, the mundane, on-going problem-solving, tuning, tailoring, further development and design in use of the existing computer support, and the integration of new applications into this existing environment.

5. Conclusions

Despite originating from four different cases, the four vignettes presented above reveal similar difficulties and problems concerning the everyday work of making e-government happen. Introducing e-government changes service provision, services and citizenship. To make it work requires the coordination of these developments along with the design and development of supporting technical and organizational infrastructures. Not only the co-operation between different actors within a municipality and with software providers has to be taken care for. Also the co-operation among different municipal actors and with the general public has to be supported. Different design processes with different foci have to be related to each other. In the discussion part, we brought up issues raised by the examples presented in the vignettes, and discussed starting points for solutions:

Participatory design provides a frame to relate different practices of design and use, and facilitate their coordination. We brought up the extension of design, and therefore participation, beyond the project.

We brought up the continuous inclusion of citizens, using actor network theory to map out complex design constellations.

Already the simple abstraction of on-going design interactions (Figures 1-5) we found helped people to understand the complexity of the development they were involved in, and opened up for new, constructive design discussions between different groups of prospective users, service providers and software developers.

We discussed tailorable software and practices of tailoring, running parallel to and interrelated with the design, development and implementation of new applications.

We discussed, finally, the concept of shop floor IT management, which, somehow, brings all the other issues together in a culture of cultivating what you have, while moving ahead towards future technology developments. Shop floor IT management implies developing a space where methods and tools such as those we have discussed can become effective. Shop floor IT management means supporting and respecting the working relations of technology production and use, and building sustainable organizational infrastructures to support them.

B.4 Suchman's concept of design as 'artful integration' (Suchman, 1994) of different contexts became for us researchers a 'boundary concept', allowing us to relate our different cases and our diverse disciplinary backgrounds. They match the scientific discourses in which e-government is discussed. To understand its complexity and handle the transition, these different discourses and the conceptual and methodological instruments they develop have to be related as well. We see our article as a step in this direction.

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Chapter 5. Citizenship at the Crossroads of Multiple Layers of Sociotechnical Relations[1]

Introduction

This article examines how citizenship is created in a variety of arrangements where people and technology co-exist. In order to understand the basis of agency of citizenship in a Nordic welfare society using information technology, we explore how the Swedish government defines and frames the space and borders of citizenship. The politics will be juxtaposed with constructions of identities and agencies in the stories of citizens' design of information technology in their everyday lives. We have constructed our article as sessions of a 'parliament of things' (Latour, 1993) where both humans and non-humans act. In the final section, we will summarise the discussions taken place in the parliament and relate the discussions to the need to extend the understandings of design of information technology.

Networks built on design, technical devices and systems create the circuits of sociotechnical relations into which we are integrated (Haraway, 1991). Humans' and non-humans' involvement and participation in the shaping of their futures and lives is a prerequisite, if the vision is to create a good life, which in the Swedish information technology context is called an 'information society for all'. If the aim is to create an information society for all, the multiple or heterogeneous voices, stories, actors and subject positions need to be involved in the shaping of society. But how to keep alive the dreams together with heterogeneity without underestimating inequality or the limitations of existing technology (Ehn & Badham, 2002)? In the circuits of sociotechnical relations, actors with different experiences and knowledges meet to keep alive the dreams and also to confront various positions, such as the tensions between stability in the form of a consensus of reproducing existing agreements and definitions and instability as renegotiating and transforming these agreements. Subjects create meanings in everyday practices, such as in design and use of technologies, but also in political documents. In the practices, various meanings and representations of the realities are contested in and through discourses[2]. However, the boundaries between subjects and objects must be transgressed if the parliament of things is to be able to be established for serious discussion of our futures.

Points of departure

There seem to be two imperatives in Swedish society. First, democratic society demands and creates active citizenship. And second, active citizenship is created and practised through information technology. A story of the good life based on stable human and non-human relations where consensus is taken for granted. There are also other stories: stories of tensions, disturbances, resistance and movements. Stories of instable human and non-human relations with room for negotiations, change and differences.

[1] By Pirjo Elovaara and Christina Mörtberg

[2] Discourses are "practices that systematically form the objects of which they speak" in Foucault (1974) The Archaeology of Knowledge, p. 49

Actor-Network Theory (ANT) is a methodological approach that provides an exciting perspective for exploring the complexity of information technology as stable and instable practices by transgressing the dividing lines between humans and humans (e. g. Callon, 1986a, Law, 1987). The ANT perspective suggests the focus should be put on the ongoing translations and negotiations between the participating heterogeneous actors. The main concern of ANT-informed research has been to follow how processes and projects, understood as networks, are stabilised while the relations between the heterogeneous actors are constructed as every single actor is enrolled in the network. ANT provides methodologies to explore how seemingly stable networks are always a result of local and situated circumstances.

After a long period of interessement[3], we enrol the so-called Scandinavian tradition of systems development to join the parliament. The central issue in the Scandinavian tradition has been user involvement in computer-based system design. The location where most of the design experiments have been done is working life, in concrete workplace settings such as industry and hospitals. The approach has had two trajectories: to participate and influence the democratisation of working life and also to democratise the design process (Bjerknes & Bratteteig, 1995). The traditional Scandinavian approach, when travelling to other contexts, partly changed its purpose and methods. Today especially in the North American context, the approach is called Participatory Design (PD). The Scandinavian approach had a very strong political emphasis and the subsequent discussions concerning the current state and future of the Scandinavian tradition have focused on the meaning of the letter 'P' in participatory design: how is it interpreted in commercial settings and whether 'P' still stands for power and political (Beck, 2002).

The ANT perspective goes beyond the traditional participatory design perspective and in so doing demands and provides a wide understanding of the concepts of participation and design. We use, therefore, design broadly as inspired by Jose Luis Ramírez' (Ramírez, 1993) Aristotelian exploration of design in a humanistic perspective. He states: "We shape not only so called material artifacts but also everything else which is given a certain meaning for us: organization, work methods, activities."

THE FIRST SESSION OF THE PARLIAMENT OF THINGS

Part A. Context: Dreams of citizenship in the Swedish IT politics

The first session of the parliament of things starts with discussions of the official Swedish documents concerning information technology. The bill 'Åtgärder för att öka användning av IT'[4] (Regeringens proposition 1995/96:125) was the basis of the social democratic government's politics during the 1990s. The politics was stated more precisely in the current bill 'Ett informationssamhälle för alla'[5] (Regeringens proposition 1999/2000:86). The governmental direction for the information technology politics

[3] See Callon, M (1986b)

[4] Measures to broaden and develop the use of information technology [Our translation]

[5] An information society for all [Our translation]

in the Swedish bill from year 2000 includes eight main sectors where the goal is to promote economic growth, employment, regional development, democracy and justice, quality of life, gender equality and equality in general, an effective public sector and a sustainable society. (Regeringens proposition 1999/2000:86). The discourses of technology, growth and prosperity, and the (gender) equality discourse exist in the Swedish government's visions side by side with the ambition to be the first nation to implement an information society for all.

In November 2003, the document 'En lärande IT-politik för tillväxt och välfärd: ITPS[6] slutrapportering av uppdraget att utvärdera den svenska IT-politiken'[7] was published (Lundgren, 2003). The document was the result of the assignment formulated by the Swedish government to evaluate the content and goals of the existing IT politics as formulated in the government bill from 2000. The evaluation keeps to the two previous main goals for IT politics: to create and guarantee an information society for all and to secure Sweden's position as the leading information society. The evaluation also wants to expand the political goals with three new themes. First of all, IT has a potential power to rationalise and to improve efficiency in order to build up and secure welfare and economic growth. Second, the direction of the edited IT politics is to move towards a net society in the sense that the focus of IT development is no longer on constructing a technical infrastructure, but there is a need to focus more on filling the infrastructure with substantial content. The third theme focuses on realising thoughts concerning developing a learning society by means of IT support (Lundgren, 2003).

To be a citizen: materialisation of the government's IT dreams

The Swedish governmental bill (1999/2000) very strongly reproduces and strengthens the idea of the state that takes care of its citizens by providing equal access to the services of the welfare state. This ideology, known as 'folkhemmet'[8] (Hansson, 1935), has been the ruling social democratic ideology in Sweden since the Second World War and has roots that can be traced back to the 1920s. The main characteristic of the 'folkhemmet' ideology has been to build up a strong welfare system that guarantees social benefits, such as child care, health care and school education for every member of society.

The current bill does not seem to renegotiate the relationship between the state and the citizens concerning citizenship from the rights approach perspective. It enforces the construction of citizenship ('being a citizen') within the rights approach. Citizenship based on the rights approach defines citizenship mainly as the status 'of being a citizen' connected to the formal equal access to the rights and benefits provided by the state (Lister, 1997). How does information technology get involved if it is considered from a rights position? Perhaps one of the key words is access: access to artefacts and access to services, to give a couple of examples.

6 Institutet för tillväxtpolitiska studier [Swedish Institute for Growth Policy Studies, http://www.itps.se/in_english/index.htm]
7 ITPS' final report of the assignment to evaluate the Swedish IT [Our translation]
8 People's home [Our translation]

The Swedish government has provided income tax relief to enable trade unions and employers to offer their members and employees the opportunity to rent PCs and software. This tax reduction has increased access to information technology and the Internet. Another measure is the project conducted by seven Swedish government agencies[9] where 140 terminals, "citizens PCs", have been placed in 100 places, mostly in the north of Sweden, but also in suburbs of the larger cities. The citizens' terminals have mostly been intended for people who do not have computers (Lindström, 2003). Another example of digital services offered to the citizens is the portal where the users have access to the authorities, their services and the Internet in general: the so-called 24-hour authority[10].

Democratic service development seems to be the message formulated in some of the latest IT political documents in Sweden (SOU 2003:55, Lundgren, 2003). When democracy is moved away from the political arenas, the main actors are no longer the politicians but the authorities. The communication between the authorities and the citizens is accomplished in the service dialogue about the quality of public services. Political visions and grounds are not the issue. This development in turn strengthens the position and role of the individual citizen as a user or a consumer of the services. The arena and goal of democracy moves to the democratic processes of the service development. IT politics has become to "realise a result-oriented and practical IT policy … for government and industry." (SOU 2003:55). A citizen in this version of the IT politics is not a political citizen, but a skilled consumer and user of digital services.

Perhaps the most evident way of understanding the linkage from the rights perspective is to claim that information technology will enhance access opportunities to the services and benefits of the welfare state and thereby enable the citizens to make use of these services and benefits. A lot of concern on the part of the government is put on taking care of the citizens, from school children to senior citizens, providing computer skills training and making sure that the essential IT artefacts are available either through private ownership or through public service channels. The great governmental project of building up an IT infrastructure takes us back to the famous speech by the Swedish prime minister Per-Albin Hansson, who in January 1928 stated: "If Swedish society is going to become a good people's home, we have to fight against class differences, we have to develop social welfare, we have to diminish the economic differences between people, we have to build up democracy and implement democracy also socially and economically." (Hansson, 1935). The connection and continuum to this ideology is existing and vivid. But now it is time to talk about 'the digital people's home' (Sverigebilden).

9 The Swedish National Labour Market Administration, the Swedish National Tax Board, the National Social Insurance Board, the Central Student Aid Board, the Swedish Consumer Agency, the Swedish Migration Board and the Premium Pension Authority
10 In Swedish,'24-timmarsmyndighet'

Part B The authentic recording from the first session of the parliament of things

"You search – I answer"
[I: The National Swedish Social Insurance Board Web Site. The Insurance Board is one of the national agencies in the 24-hour agency. The National Swedish Insurance Board was also one of the national agencies that participated in the portal project presented above. You: A citizen]

You: I would like to find some information about social insurance benefits.
I: It seems that you are a competent member of the society. You have found your way to me. And you possess the computer skills I demand. So far, so good. And your PC and Internet connection, are they in order?
You: Oh yes. Unfortunately, my PC does not want to use the broadband connection.
I: That's bad, but I can enrol my modem friend**.** In that case, you will have to be satisfied with my text-based solutions. OK?
You: Well, do I have any choice ?
I: No, actually, you don't.
You: I hope you accept misspellings and Swedish that's not always grammatically correct. I also wonder if I can use my mother tongue, Finnish, when I communicate with you.
I: It depends. If you are using my databases then your spelling has to be 100% correct. In addition to this, you also have to use the keywords I have chosen. Unfortunately, I only speak Swedish and some English.
You: Well, OK then…
I: Wait a minute. I forgot to inform you that you can use my categories and classifications when you look for information!
You: What do you mean by that? Please, give me some examples!
I: First, you have to decide if you want to choose the Internet for private persons or the Internet for employers. If you continue for private persons, you can: submit notification of a sick child, apply for temporary parental leave, notify about paternal leave, plan for withdrawal of a parent's allowance, apply for a temporary parent's allowance for paternal leave.
You: Do you only deal with parents? Is that all the services available? Are not all public services available via the Internet?
I: Well, let me say first that I think that all services that exist here and now, which we just can take as they are, attach. It's not about creating new services, which probably wouldn't be my cup of tea anyhow, as service development is not my field. But because I am just a 'child' and at the beginning of my career and assignment, I haven't come further than this yet.
You: And I also notice that you make a difference between being a parent and being a father.
I: Well, I'm part of Swedish society, always striving towards gender equality, but where gender relations seem to be reproduced**.** There are parents and then there are fathers. Different rules and agreements. But I only follow orders. I do what I am delegated to do… There might be one more restriction.
You: ?

I: In some cases you have to prove your identity. You have to use a legitimate password or your e-identification. In this respect, I co-operate with some banks. If you already are a customer in one of my partner banks, then you can use the same identification you use when you use the bank services on the Internet.
You: Oh, I see that you are already implementing the private–public partnership so popular in the political debate today…

THE SECOND SESSION OF THE PARLIAMENT OF THINGS

Part A Context: Citizens as actors
The traditional ideology of the Swedish welfare state has been based, put in quite simplified and rough terms, on a view of the citizens as a collective. Consequently, the services the state provides have also been based on an ideology that does not support individual choices. The current governmental bill from 2000 still supports the basic ideologies of the welfare state, but also contains signs of change. One of the changes in perspective is putting the individual citizen in focus and stressing the active role of citizens in developing the democratic functions of the state: "The development of the Internet opens up new possibilities for public control and dialogue, direct democracy and control by the citizens. The dialogue on these [virtual] arenas can change the possibility of the citizens to gain influence." (Regeringens proposition 1999/2000:86). Here, citizenship is no longer a question of being a recipient and user of the public services, but demands both being responsible for one's own choices and activating one's own opinions, claims and wishes. The message of the government seems to be that citizens can control more directly the functions, decisions and directions of the state. We are invited not only to be citizens, but also to act as citizens (Lister, 1997).

What kind of individualistic turn is being suggested by the Swedish government then? Does the government want to listen to the voices of the individual citizens " …reduced to atomised passive bearers of rights whose freedom consists of being able to pursue their individual interests" (Lister, 1997)? Or is the agency a community agency based on individuals communicating and participating as a collective? Is the agency of the citizenship 'expressly political and, more exactly, participatory and democratic'? Does the politics still involve 'the collective and participatory engagement of citizens in the determination of the affairs of their community' where we conceive of ourselves as 'speakers of words and doers of deeds' mutually participating in the public realm' (Lister, 1997)? The current bill does not discuss which of these directions the Swedish government is pointing to when presenting the new agency of the active citizen. Nor does the bill problematise the question of whether (all) citizens are able to act as citizens from and with their resources and experiences.

Where are the virtual arenas where the active citizens can participate in and influence political decision making? Examples in the Swedish context are few and mostly materialised in creating web sites for consultation in questions articulated and framed by the municipal authorities. In northern Sweden, in the municipality of Kalix, the citizens have been invited to discuss and give their opinions about which of the suggested alternatives for the physical formation of the city centre they would prefer. The spatial

planning of the city has also been in focus in the municipality of Ronneby, where the citizens were encouraged to express their opinions about the upcoming comprehensive plan. In other municipalities, for example in Bollnäs and Sölvesborg, a web-based discussion forum has been created to facilitate discussions between politicians and the citizens. Within the forms, rules and traditions of representative democracy, the "consultation model is to be developed in municipalities through practical exercises…" (Lundgren, 2003).

Part B The authentic recording from the second session of the parliament of things

"Citizens participate – I say how and when"
[Government: The Swedish government. I: Internet technology. Friend: Technology allied with the Internet.]

Government: I have a proposal for you: "[Let's] follow research and development of new technologies and methods within IT in order to promote a broad participation of the citizens in the framework of representative democracy." (A written formulation you can find in one of my proposals, identification number 2001/02: 80, to be more precise, turn to page 61). I think you would be a perfect partner to work with me because you already have experience from working with developing and providing information services to our citizens. I whole-heartedly believe that "Citizens' capability to search for information, acquire knowledge and create dialogue on the Internet will be of great significance for the citizens' participation in the political process in the future". (If you are interested in learning more about this, check out my proposal 2001/02:80.)
I: Sounds interesting. But can I ask you to clarify a number of points before we carry on?
Government: What kind of clarification do you need?
I: You talk about being an active citizen in a representative democracy. Do you mean that representative democracy is the frame for participation?
Government: Yes. Our experiment must under no circumstances threaten our forms of representative democracy. However, the experiments may well provide an opportunity for us to revitalise our representative democracy, because there are apparent problems: people are not that keen to take part in the political work or be active in the political parties that are the very foundation of representative democracy.
I: Well, can you give me explicit examples of what you would like me to develop. What do you want the citizens to do?
Government: Discussion fora, consultation, pose questions to the politicians, chat.
I: Peanuts. I think I can manage that.
Government: Could you give me a time schedule?
I: Well, it depends. Do you want to have unique, tailored solutions or would it be possible to re-use some of the solutions that are already tested and functioning in other similar contexts?
Government: Well I think that in this era of recycling we'll choose the re-use alternative. I suppose it saves us both time and money? In order for us to keep our leading

position among nations in terms of IT, it's important to implement the services as fast as possible.
I: Let's sign the business agreement!
- - -
Friend: Another of those re-use assignments?
I: Well, I have to make a living.
Friend: But aren't you getting bored?
I: I cannot afford that – it's too expensive. And to be honest with you, it's also convenient…
Friend: But wouldn't new solutions be much more interesting and challenging? What about our own future? Isn't there a risk that you are not updating your skills?
I: What can I say…It's not always I who decides the rules of the game. I'm not the only one developing services for the public sector. There are competitors. And doing these re-use assignments gives me money and therefore space to complete and update my skills and qualifications.
Friend: How about the negotiations with the other partners you will need in this new assignment? Do they accept the rules of the game?
I: There might be some disturbances. Some of the partners are not that loyal to the agreement…

THE THIRD SESSION OF THE PARLIAMENT OF THINGS

Part A Context: Situated and local practices
Citizens intervene in the discussions in the parliament through experiments concerning technology and active citizenship. On the stage, we have women who are mostly invisible in the public arena, skills, software packages, citizens' dreams and the repertoire of technology. We will illustrate what took place on the stage through two stories from the county of Blekinge in south-eastern Sweden.

The Women Writing on the Net (WWN) project at the end of the 1990s was a subproject within the framework of the DIALOGUE project directed in Bologna in Italy, London, Lewisham in UK and Ronneby in Sweden. The overall aims of the Dialogue project were to further grassroots democracy by working with "empowerment", to conquer and redefine the public arena, to stop the drawing up of boundaries or dualism between public/private and expert/non-expert and to build virtual communities. The goal of working with "empowerment" within the WWN project was to encourage the participating women to redefine themselves: to become and act as insiders in IT contexts, as well as in society as a whole. By using their own experiences as a source of knowledge, the women were able to renew the value and strength of these experiences. The vision was to weave together the overall goals with the practical working methods and the individual elements of the project. Two groups, consisting of women with greater or lesser experience in using computers met once a week for one year to discuss, write and learn how to use and design the new technology. The aim was to create a virtual space for women on the Internet and to explore the writing process in terms of aim, tool and method. The method of approach incorporated reflections and discussions about empowerment, democracy and representation of women. This

created a more complex understanding of the values of the dominant IT discourses and revealed the "cracks" in and possibilities of feminist redefinitions of these values (Ekelin & Elovaara, 2000).

Another example is the Swedish county Blekinge's involvement in a special regional development programme at the end of the 1990s called IT Blekinge.[11] The aim was to explore how to harness the challenges of the growing information society and how to avoid negative consequences of new technologies. One project was the establishment of telecottages, BIT houses, in villages in Blekinge, which was conducted by an umbrella project 'BIT-världshus i Blekinges tätorter' [10 BIT houses in the villages of Blekinge]. Three main aspects were prioritised: enabling citizens to get access to and gain skills of IT; establishing small local companies; using the county as a full-scale laboratory for IT experiments. The evaluation of the BIT houses showed how the telecottages became meeting places for citizens where they were able to use e-mail, surf the net, use and learn about new technologies, play games, etc. The local activities were in keeping with the Swedish government's aim of creating an information society for all as well as the aim of involving the citizens in the development of the region. The IT Blekinge project was based on a bottom-up approach promoting local agency, but the local projects still had to make effort to be considered as equal partners. The establishment of the local BIT houses was a challenge since the project team had to deal with numerous factors such as various representatives' expectations, visions and dreams and also the limitations of the existing technologies. The focus on the local settings resulted in limited time to reflect on how to become a full-scale laboratory for IT experiments (Ekdahl et al., 2000).

Part B The authentic recording of the third session of the parliament of things

"You want to design – Do I want to collaborate with you?"
[You: A citizen. I: Internet technology]

You: Hi there, do you want to do some experiments with me?
I: What kind of experiments do you have in mind?
You: There is so much talk about active citizenship nowadays, but when I look around at the web sites available, I feel a bit disappointed. Asking a question and sending it to a politician, that's not my idea of democracy.
I: Re-use no longer provides any challenges, and convergence between different media actually creates new possibilities for citizens to intervene in the development of both technology and society.
You: How far are you prepared to go?
I: I am a child of the Scandinavian tradition of participatory design.
You: Scandinavian tradition of…? What's that. I've never heard of it. Tell me more!
I: The aim was to build alliances between me and workers' representatives in workplaces in order to develop democratic processes for technology development.

[11] Blekinge was one of 22 regions in 11 EU countries involved in the programme called *Regional Information Society Initiative (RISI)* in 1997-1998.

You: Sounds awfully exciting. Do you think that it would be possible to implement that approach here and now, and if so, would you be interested in working with us from that perspective?
I: Yes of course, but since I have changed and society has changed too, I think we need to develop and design other alliances and ways of co-operating. We have never used the participatory design approach in sectors other than working life, so it will require a great deal of discussion. We have no ready solutions or models of how to work. One of the key questions is where will we find the alliances we want and need: from the existing political forms or 'new political movements'? And in what way do you want me to participate?
You: I don't understand. What are you talking about?
I: Do you want me to design the web interface, develop new functionalities (which will require analysis and design), to replace text-based communication with oral communication, to use sound and images and other configurations, or are you interested in open-source programming? Do you want to use only my web embodiment or have you considered involving my mobile siblings?
You: Do you mean that everything is possible on the Internet?
I: Almost.
You: In that case, why do all web sites (or almost all of them) look the same?
I: Perhaps it is because of the standard software, protocols and databases, but it is also probably due to a tacit agreement about how the website of a public authority should look. How to present information and how to participate. The limitations are there.
You: Then I think that design must be both about technology and democracy at the same time. And that demands a democratic design process where both humans (including ensembles of citizens) and non-humans can participate as equal members. A parliament of not only people or not only things, but a parliament of humans and non-humans. Any comments? Are you willing to join?
I: I am willing. But since my language is sometimes hard to understand because I hardly speak any Swedish and I am very fond of my special terms, I would like to have a person who can be my interpreter: a system developer participating in the parliament. You may find me rather mean, but I think you are a hopeless romantic, hanging on to old ideals, such as "collective design". Hah. Remember that we are living in the 21st century – a century that belongs to strong, well-informed and well-educated individuals compared with the situation in the period when the Scandinavian tradition was alive, mainly the 1970s and 1980s. If society as a whole does not support collective work, how can you expect technology design to do so?
You: I am not alone in being accused of being too old-fashionedly political… Just listen to Donna Haraway. She says: "Rather, feminist inquiry is about understanding how things work, who is in the action, what might be possible, and how worldly actors might somehow be accountable to and love each other less violently" (in her book 'The companion species manifesto: dogs, people and significant otherness', which was published in 2003). But she also reminds us not to believe that we can choose an innocent or pure position. There are differences, including differences in power.
I: I am very grateful that you asked whether I want to join your project. I am so often accused of being conservative, reinforcing the static, stable order of the society, making things complicated for ordinary people and so on.

You: I think you have the capacity to transgress many boundaries. If we are working for change, perhaps the change does not come from the existing arrangements but from an unexpected direction: namely technology!

DREAM WEAVING – A SUMMARY OF
THE DISCUSSION IN THE PARLIAMENT OF THINGS

During the sessions of parliament, the secretariat took minutes of the discussions, debates and negotiations that took place among the parliament members. The tensions, ambivalences and contradictions between stable and unstable understandings and imaginations were obvious in the sessions. It is therefore time to publish the diffracted (see e. g. Haraway, 1997, 2000, Mörtberg, 2003) notions in order to direct the content for the coming sessions of parliament with a view to transforming the politics of talking into politics of action.

Paragraph 1 Competences / expertise
The participants in the parliament discussed gender equality, competences and the boundaries between professional designers and other designers. It became obvious how relatively limited groups of men who possessed specialised competencies gained in specific positions had participated in the development of the computer technology of the 1950s in Sweden. This meant an early male dominance in the field in Sweden (Mörtberg, 1997). But, in the middle and end of the 1990s, feminist researchers started to point out breaks and fissures in the male dominance in Sweden (Roman, 1994, Blomqvist, 1994, Mörtberg, 1997). Despite these changes, public debate still focused on the absence of women in education and professions in the IT sector and its images. This image still dominates campaigns and projects with an aim to encourage more women to enter computer science and the IT sector (Mörtberg, 2001). However, there is also a competing discourse. Pirjo Elovaara's (Elovaara, 2001) point of departure is the everyday practices of four librarians. There is a predominance of women working as librarians in Sweden. Mostly librarians do not have the same right to speak about information technology as, for example, systems designers, programmers or system administrators. By creating space, interpellating librarians, and giving them the right to reflect upon IT, how they use IT, and how they express their expectations, dreams and visions, other meanings were shaped than those based solely on the absence of women. Stories that highlighted the question of insiders and outsiders and thus also the public image are primarily based on computer science (Elovaara, 2001).

Technology has also made journeys. From being a black box reserved above all for experts, it has changed its shape due to what is commonly referred to as the "convergence". The design of the Internet applications is different compared with development of traditional information systems (IS). The concrete differences are: reduced time; the importance of graphic interface design; the prospective user is a customer not an employee; the strategy needs to be related directly to business goals. However, in cases where the application relies on databases, or Internet applications are integrated with enterprise applications, there are similarities with the traditional development of information systems (Avison, & Fitzgerald, 2003). Development of traditional IS has also changed, since prospective users/customers possess far more knowledge about information technology than they did in the 1980s, and also since the developers do not always know who the prospective user will be. This has also had implications for the participatory design approach.

Thus, discussing design of and for active citizenship also mobilises negotiations of borders, since the traditional border between the designer and the user is being renegotiated. Randi Markussen (Markussen, 1996), a Danish researcher, states: "As they [information technologies] move from the realm of experts into the workplace and mingle more intimately with other activities, the idea of computer expertise and the boundaries between developers and users are questioned…" What she is suggesting, especially as far as Internet-based applications are concerned, is that the traditional boundaries of what constitutes expertise and who is an expert of design are being extended and thereby also blurred. If the original idea of participatory design was to develop tools and methods to support the mutual co-operation between different groups of experts, it nevertheless kept the skills and positions of these groups separate, by talking about designers and users.

Is it possible to use participatory design in Internet applications? What does participatory design mean in the present day? Who is a designer? What kind of qualifications does the designer need?

Paragraph 2 Citizenship
If citizens are regarded as subjects who are constituted by an ensemble of subject positions, there are many practices of citizenship (Mouffe, 1992). Thus, it is impossible to speak of a unified and homogeneous agent or citizen in the way, for example, the governmental bill does, if the aim is to create an information society or a knowledge-based society for all. Humans are integrated in the circuit of sociotechnical networks where the subjects are positioning themselves or are placed in a position depending on the relation in a certain situation (Haraway, 1991). Relations such as gender, ethnicity, class, sexuality, age, religion, etc. are intertwined with the interactions between humans and non-humans. The agencies take certain forms in specific situations, since an individual person can be subordinated in one relation and dominant in another (Mouffe, 1992).

To design active citizenship? What is design in this context? Is it easiest to start the work from the perspective of equal access and service provision? What does ease in that case consist of: the clear definition of contents, the clear definition of roles between designers and users, and the stable enrolment of materiality? Who are the designers? Is it the task of the governmental authorities only? Has technology the agency repertoire needed?

Paragraph 3 We design what we can imagine[12]: representations and responsibility
Systems development[13] is a social and cultural process aimed, for example, at solving a problem in a domain, making an organisation more efficient, or marketing new services/artefacts, by the means of information technology. Systems design consists of a set of processes in which the ideas, visions and functionality of the future system are created. The details will be constructed in various activities by numerous professionals during the process.[14] Tone Bratteteig (Bratteteig, 2004) argues that "we design what we know" based on research of the outsourcing of software design from Norway to Russia and India. This was a starting point in the parliament. But, the participants in the parliament decided to change "know" to "can imagine" based on Erik Stolterman's (Stolterman, 1991) arguments that visions come into view very near the beginning of the design process before the present domain or situation is analysed and also after an intervention by one of the authors[15]. The designers' ideas, values and understandings are intertwined with their visions of the future system, service or artefact (Bratteteig, 2004). In the practices, various meanings and representations of realities are contested in and via discourses. Rules and obligations create peoples' ideas, values and thoughts, but also govern who is able to speak of what and when. Thus, the designers' visions of the future system are created in discourses – discourses that govern their visions.

Systems development, like many other disciplines, is based on classifications, categorisations, standardisations and formalisations. Systems designers create models through abstractions, that is, representations of a practice. Furthermore, representations work like design tools in order to understand work practices, since it is impossible to represent or to understand everything (Suchman, 1995). The abstraction process includes linking together, via some form of representation, experiences and competences developed and acquired at a certain time and in a certain place (systems design in this case) with experiences and competences from another time and place. Representations are partial understandings, since it is impossible to represent or to understand everything. However, the models are based more on local and situated knowledges when the interplay between use and design is in focus (Bratteteig, 2004). Systems designers can be characterised as modest witnesses due to their qualifications of knowing certain things (Haraway, 2000). Hence, their involvement represents a responsibility for the technology or the system that is developed, but also for the methodologies and methods that are created.

Regardless of the professional designers' knowledge and accountability, we must return to a question raised in the parliament: is it possible to operate with one single broad – and thereby non-specific – category of user in a development context, where there are users on many different levels and where a user might at the same time, in another relationship, also be a designer? And where the design and development scene is also occupied by a wide variety of actors: governmental visions, politicians, local political texts, private companies, a diversity of staff, organisations and their traditions, money and time. (See also the discussion in Dittrich et al., 2002).

Paragraph 4 Categorisations and classifications
In the parliament, the participants drew attention to how categories and classification systems demand competent members of society. The choice of a category or classes becomes meaningful by certain understandings being given higher priority than others. Stabilisation takes place in material practices in a mutual process with skills human and non-humans possess and prevailing discourses. However, classifications and categorisations are not only ways of structuring and organising our worlds, science domains, disciplines, theoretical starting points or data material; they also create boundaries. The creation of boundaries intervenes in peoples' way of thinking as well as in what we can and cannot see, because concepts and categories are taken for granted and used as if they were "natural". As Susan Leigh Star (Star, 2002) emphasises: "Standards are standards, and they embody values, simplifications, and treaties". However, categories are not stable or frozen since "there are always more things going on than you thought" as Donna Haraway says about how classifications and standards work (Lykke & Markussen & Olesen, 2000).

Paragraph 5 Amplifying representative democracy
The democratic space where technology and the citizens are invited to act by the Swedish government is not unlimited. By contrast, the boundaries are quite strictly drawn. On the one hand, the dream of the active and participating citizen is inscribed and folded (Akrich, 1992, Latour, 2002) in the technology. This dream is accessible in the government bill from year 2000: "The development of the Internet opens up new possibilities for public control and dialogue, direct democracy and control by the citizens. The dialogue on these [virtual] arenas can change the possibility of the citizens to gain influence." (Regeringens proposition 1999/2000:86). On the other hand, there is a script with the dream that the activity and participation should not transgress the stable and ordered forms of representative democracy, as articulated in the government bill from year 2002: "…in order to promote a broad citizen participation within the frame of representative democracy" (Regeringens proposition 2001/2002: 80). The government aims to strengthen, amplify and reinforce one form of democracy and not to threaten it, i.e. to change it or replace it with alternative forms of political ruling and steering. To act and react but not to pro-act is the trajectory, because in the Swedish context it is quite obvious that "new technologies travel on old social relations" (Shiva as cited in Ekdahl & Trojer, 2003, p. 221). The same combination becomes and has already become the trajectory of technology in cases where technology has accepted the government's invitation and joined the democracy–technology enterprise. Fusions between the social and technical, in all their hybrid formations, tend to become solid and strong. Following the famous words of Bruno Latour "technology is society made durable" (Latour, 1991), we can paraphrase and say that technology is representative democracy made durable. This can happen due to the dual black-boxing process whereby both technology and democracy are black-boxed, in the sense that we do not

[12] Based on Tone Bratteteig's (2004) heading: We design what we know
[13] Systems development and systems design are used synonymously here
[14] This work can be organized in a variety of ways (see e. g. Bratteteig, 2004)
[15] She has experience of constructing computer-based systems for control and monitoring of hydro power stations without any prior knowledge of this fieldarea

query technology and democracy, and finally, even less seldom do we ask the hybrid 'technologydemocracy' if things could be otherwise. Design in this context applies to society, technology, use and users of technology (see e. g. Silverstone & Haddon, 1996, Woolgar, 1991).

Democracy in Sweden is not only politics, but also investments in the so-called service society (see SOU 2003:55). The citizen is no longer only the political citizen; the future citizen is a consumer citizen. The latest political documents in Sweden propagate digital services, such as applying for a day-care place or a building permit or filing a tax form on the Internet. But they also propagate a more individualised citizenship, a citizen as a customer or as a client. What this will mean in the longer run for society and participation in the mutual decision making beyond consumption is a question for the government, citizens and technology to engage in.

There is one more dimension concerning the digital service society, namely that the words 'efficiency' and 'rationality' are occurring more and more frequently in the recent Swedish political documents. These words remind us of the early days of computerisation and automation (see e. g. Annerstedt, J. et al., 1970). Is technology really keen on taking a detour back to the 1970s and be enrolled in an old role once more? It is even more important to ask if technology really has the capacity and repertoire necessary for this assignment? Does technology ask: efficiency in technology is fine, but I would like to discuss efficiency and rationality for whom: the government, the citizens, the civil servants or technology?

Paragraph 6 Rebels

Both people and technology seem to have a capacity and will to transgress the boundaries interwoven in the technologically embedded scripts (Akrich, 1992). The scripts do not always work in the intended ways, as the story of the photoelectric lighting kit told by Madeleine Akrich reminds us (Akrich, 1992). People may find unexpected ways to use technology, they may refuse to use technology and technology may strike. The door grooms strike and the fuel cells refuse to join the VEL project (Latour, 1997, Callon, 1986a). We could also tell countless everyday stories of printers, networks and computer devices that simply do not work. One way to protest seems to be to step aside, strike, refuse, make resistance, to be out of order or to break down. People can act in these ways too. Norwegian secondary-school administrators may be resigned or doubtful (Gansmo, 2003). Increased access does not necessarily mean an increase in usage of services and citizens' involvement in the creation of an information society for all as the stories of the Swedish trade union members tell (Olsson, 2002). Neither humans nor non-humans are fully accountable. Technology may use people in unexpected ways and vice-versa. Technology and people may find allies outside the governmental space of representative democracy, programming languages escape the boundaries of fixed agreements and move over to open source, professional programming practices are re-negotiated (e. g. extreme programming, agile programming).

There are the enthusiastic stories from the early period of computer-based communication of people with mutual interests building up communities to support each other, disseminating information and making experts and their knowledge available outside the ordinary channels (see e. g. Rheingold, 1996). "There are organizations that have received computers as gifts but which cannot afford to employ people to teach how to use them. We find a person who designs the web site free of charge", says Shallabh Sahai in a Finnish newspaper in January 2004.[16] Sahai is the founder of an organisation that mediates voluntary IT and computer specialists to non-governmental organisations. In the same newspaper, Rasmus Tenbergen tells about a web site, The World Parliament Experiment, called 'a global parliament' open for anyone who wants to discuss the global political issues. The interview with Tenbergen ends with these words: "Many people think that a world parliament is naïve and impudent, and even dangerous. But this is the first time it is technically possible to implement the idea, thanks to the Internet. One has to start somewhere." The protocols and languages of the World Wide Web do indeed co-operate with anyone who wants to use them (Hannemyr, 2002).

Are we building up a shadow society that exists alongside the official society in order to correct the problems of formal politics? And how is the world of formal politics responding to the activism growing beyond its borders? Does the government look for inspiration from reality television and its implementation of interaction and activism, as suggested by professor Stephen Coleman when he visited Sweden in February 2004?[17]

Comments and Suggestions

The discussions in the parliament of things showed how the construction of 'digitala folkhemmet' [the digital peoples' home] takes place through the loving and caring state, which is however a state and citizenship in transformation. But we have also shown a variety of meanings of information technology, citizenship, agency, gender and design. Are 'digitala folkhemmet' [the digital people's home], its promising intentions and trust in the state still obstacles in the creation of more active citizens despite an increased access as well as more widely possessed skills and competence in IT? Or do the continuous meetings between systems and IT designers, technology and citizens in local practices become the practice where the dreams are woven together through 'an artful integration' (Suchman, 2002)?

The Scandinavian tradition of systems design is one of the most promising approaches when designing of 'democracy in a technological society' (Mörtberg, 2002). What is needed in the 21st century is to enrich the Scandinavian tradition with new metaphors and figurations. Could the future of the Scandinavian approach of systems design be a future of cyborgian design with alliances of human and non-human assemblages, where innovations are always an option but where accountability constantly has to be negotiated? The cyborg is at the same time a powerful and mystical guide skilful in things that should bother design in the amalgamation of democracy and information technology as well. The cyborg has practised uneasy but necessary boundary transgres-

[16] Helsingin sanomat, 26 January 2004
[17] See the interview with Coleman in the Swedish newspaper Dagens Nyheter, February 2004

sions. It knows a lot about things that are possible and impossible at the same time as well as being both fact and fiction. The cyborg possesses a rich non-linear imagination and fantasy. And as Donna Haraway so aptly puts it, the cyborg stands for the possibilities of further politics: "dangerous possibilities which progressive people might explore as one part of needed political work." (Haraway, 1991).

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Chapter 6. Between Stability and Instability – a Project about e-Democracy

"*There are differences in the mode of travelling, the reason for the trip, the point of departure and destination, in the places through which one will pass, the speed, the means, the vehicle, the obstacles to be overcome, in what space and time.*"

(Serres & Latour, 1995, p. 111)

1. Introduction – Unfolding the project

The aim of this article is to present, analyse and diffract[1] a project called 'KomInDu' conducted in 2003 in a municipality in south-eastern Sweden. The project was defined in the project application as an e-democracy project: "*The starting point is our own and others' experiences of e-democracy […]*"[2], with a special focus on activating citizens to communicate and interact with the municipality via the web site constructed by the project: "*[…] Based on democratic values, the project is aiming to develop and evaluate methods for citizens' communication with the municipality. Questions, answers and opinions of local municipal interest are going to be highlighted […]*"[3]

My point of departure is the technology part of the project, as expressed in the project application: "*[…] using Open24 as the development [software] platform in co-operation with Blekinge Institute of Technology and the software company Your Voice in order to work towards better and better applications […] in adaptable web interfaces […]*"[4]

I will discuss the process of constructing the web site for the project as the 'case'. The focus is on how the concerns of the communication and interaction to be conducted on the planned web site were interpreted during the project discussions. The overall theme of the first part of the article is how the project was striving towards stability and how this stability was constructed in ongoing negotiations during the time the project had at its disposal. How did the project travel in order to reach its goal – the construction of the web site? The story of the construction work is intentionally long in order to follow the line of negotiations that moves between stability and instability.

Then I will discuss how the word 'democracy' worked and was worked with during the project. The starting point is the project articulation: "*[…] Based on democratic values, the project is aiming to develop and evaluate methods for citizens' communication with the municipality*".[5] I want to explore what kind of contribution the notions of stability and instability can make to the democracy negotiations of the project.

[1] The figuration of diffraction comes from Donna Haraway (1997, 2000). Christina Mörtberg (2003) writes: "Diffraction that elucidates how visions and dreams are kept alive, along with various meanings created in local practices […]" (p. 65)
[2] The project application dated 31 January 2003
[3] ibid
[4] ibid
[5] ibid

The final discussion concerns the hyphen between the letter 'e' and the word 'democracy'. I will ask in what way the project was able to bring together the two parts of the project (e and democracy). My intention is to explore what happened in the hyphen space in between. I conclude the article with the question: was the project able to stabilise and integrate the two themes. Is this marriage even possible? Are technology ('e') and democracy entities that are generally eager to communicate with each other? Does the hyphen suggest that the 'artful integration' (Suchman, 2002) is necessary and also possible? How does it then become possible? The underlying approach in my article is to regard e-democracy as a process, co-habited by several heterogeneous actors in collaboration, where all of them are ordered in a number of diverse arrangements.

Another aspect that intensifies the complexity of the project is the number of actors. The official project partners as defined in the project application were the municipality of Ronneby, Blekinge Institute of Technology, the software company Your Voice and later on also the advertising company Sirius. Thus, the project was a multiperspective experiment due to the participating actors coming from both the public sector (the municipality and the university) and the private sector (the software company and the advertising company). The project was a combined research and development project incorporating a number of heterogeneous perspectives. The competences and practices from two municipal departments (the department of spatial planning and the municipal information office) co-operated with those of a variety of academic disciplines (computer science, informatics, spatial planning and feminist technoscience studies) and the competences and practices of the participating companies (computer programming, web design and 'journalistic writing'). From the very outset, the technology in the shape of the Open24 software was also an actor enrolled in the project as well as the spatial planning: "*[…] Spatial planning, in connection with the comprehensive spatial plan, housing and citizen services are the main issues […]*"[6], in the shape of the proposal for the comprehensive spatial plan, created in a process that had taken place several years before the KomInDu project. How did the heterogeneous actors participate in the stabilisation processes when shaping the project with its special focus on activating citizens to exercise their citizenship by communicating and interacting on the project web site?

In the following section, I will present the analytical orderings I have chosen to adopt in order to find a way to organise and structure the process of the project and thereby also the story about the project.

2. Analytical orderings

This paper is based on my own experiences as a research participant in the KomInDu project, interviews with the other project participants, notes based on the recorded project meetings and workshops, and videotapes from the workshops. During the project time, questions concerning and connected to the issue of stability, such as 'What is happening?', 'Is anything really happening?', 'How far have we come?', 'Is the project stable enough?', 'Why do things sometimes feel unstable in a negative way?',

[6] Project application dated 31 January 2003

'Why is there so much talking?', 'Is all this talking really adding anything valuable to the project?', 'How should the web site be constructed?' were hanging in the air. There was a strange texture of anxieties, frustration, but also a strong feeling of meaningfulness and importance present in the project. The project seemed to have many facades, contradictions, stories and voices all layered into each other.

But what were these different layers all about? Or were they really different layers, in the sense of: were they stories that could be told separately from one another? If so, it would mean that there had actually been several projects going on within the KomInDu project. This solution feels both correct and incorrect. If you only look at the interface of the web site that the project designed and constructed, it is quite likely that much of the project work is not visible. We see only a frozen snapshot. Inspecting the web site, you would conclude that the project cannot have been that challenging. Surely creating a web site can't be all that difficult, can it? This seems to be one of those thousands and thousands of IT projects that are taking place all over. However, having taken part in the project meetings, workshops and discussions with the participants, it is obvious that the project had several layers. My next step is to find and choose ways of sharpening my perspective in order to move on from these initial vague, unfocused feelings.

Complexities

Annemarie Mol and John Law write: "*How might complexities be handled in knowledge practices, non-reductively, but without at the same time generating ever more complexities until we submerge in chaos?*" (Mol & Law, 2002, p. 1). How to take care of the complexity of the project because there is an obvious risk that you will end up presenting a text that follows the typical story line of academic texts, which "*…make smooth schemes that are more or less linear, with a demonstrative or an argumentative logic in which each event follows the one that came before….*" (Mol & Law, 2002, p. 3). Once more, I borrow the words of Annemarie Mol and John Law when they ask: "*How might a simple text respect complexities?*" (Mol & Law, 2002, p. 6). How can one write the complexity, phrasing it in words that make it possible to tell a story of a project in a way that is easy enough to follow – even for a person who did not participate in the project – and at the same time keep the messiness, the uncertainties. How to oscillate in the writing process?

But what is this complexity Mol and Law are writing about? Do they provide means, threads and challenges to the issue of layered writing? One direction is suggested that is important and interesting for my purpose. According to Mol and Law, complexity can be analysed from perspectives of multiplicity which "*is thus about coexistences at a single moment.*" (Mol & Law, 2002, p. 8). First movement is taken: from messiness via complexity to multiplicity. Parallel to asking what complexity is, I have to ask how multiplicity can be understood and interpreted? The rather cryptic answer is offered: "*[to be] more than one but less than many*" (Mol & Law, 2002, p. 11). Things might be brought or kept together by several orderings that meet, and in this meeting a "*complexity is created*" (Mol & Law, 2002, p. 11).

This suggests that things that might at first glance be understood as contradictions and separate units were actually working together in the project and where different positions were woven together in very sophisticated ways. Sometimes things were the same, sometimes they argued with each other, and went apart and sometimes they met at one point, interfering with and influencing each other, at the same time both keeping their shapes and changing them. The project could be both-and, not either-or. The contradictions were not to be overcome, instead we had to accept and even appreciate living within them (see e. g. Mörtberg, 1997). This is the first analytical ordering.

Stability and instability

The second way to analytically order the project is to think how stability and instability are shaped and created in heterogeneous processes. How and when get processes stabilised, and what does it take to stabilise them? Do stable processes tolerate instability, and does every divergence mean disturbance? Are stability and instability always counter-partners? Is stability always something positive by definition and therefore instability always something negative by definition? Because these questions have been and still are central to Actor-Network Theory (ANT) and its further development, sometimes called Actor-Network Theory and After (ANTa), they provide frames and perspectives for understanding and exploring the notions of stability and instability. Much of the research using these approaches has focused on projects and processes with special attention on boundary drawings and/or movements and/or between stability and instability.

ANT suggests that the stability of various networks is based on committed and reliable enrolled actors, translations, negotiations and agreements of the goal(s) and immutable internal network relations (see e. g. Callon, 1986, Law, 1987). Stability building is the very issue for networks. But what about instability? One has to go beyond the traditional ANT approach to find a perspective beyond stability or expand understanding of the notion of stability. Is all stability always something positive in itself? Are network relations always stable, and if not does it mean that the network breaks down? What the later development of ANT, Actor-Network Theory and After (ANTa), suggests is that there is space for change, tensions and turbulence. Aspects that do not by definition increase the negative instability of the network, but which actually make the network more flexible and elastic. What we get is a more nuanced matrix of the stability and instability. In some situations stability is the issue and instability something to avoid, but in some situations instability is the issue and stability something to avoid. In other words, how do stability and instability interplay and interrelate to each other? The second analytical ordering.

3. Stabilising the project or Working with the letter 'e'

The goal of the project was to construct and publish a web site, called Vision Ronneby (www.vision.ronneby.se). The initial discussions about the web site started to circle around precisely the themes of communication and interaction. Questions, ideas and suggestions were formulated in regular project meetings.

Negotiating communication – building up the web site

Already at the first project meeting with participants from the two participating municipal offices and the different university departments at the end of February 2003, discussions were initialised concerning what communication and interaction in the project context could be and how communication and interaction could be shaped on the project web site.

Voices from the meeting expressed the view once again that the overall goal for the KomInDu project was to develop communication with the citizens. Sincere wishes were articulated by the civil servants at the municipal office for spatial planning: "*We want to have discussion, the thing we dislike most is silence, it is good if we get opinions, it gives us cause to act, this is a way to create dialogue.*"[7]

Discussion and dialogue were the consensus of the meeting. But in the same breath, some of the project members articulated possible complications caused or raised by and in the web-based communication: "*If the dialogue is between one single person and the web site, should these contributions be based on e-mail communication or should all contributions be published on the web? There are problems with people between the ages of 30 and 40 years: they never respond, unless you tread on somebody's toes; there are diverse opinions about how quickly and how thoroughly the questions asked should be answered; it may be difficult to influence the comprehensive spatial plan.*"[8]

Nevertheless, the trajectory was the same for all the actors participating in the discussion, namely to create a place on the Internet for communication and that the communication should be about the spatial plan, as expressed in the project application: "*[…] to take the point of departure from the Ronneby municipal spatial comprehensive plan, which is under construction. Alternative parts of the spatial plan will be selected and presented on the Internet and they can be discussed, illustrated and commented.*"[9]

The trajectory of the first project discussion, which took place in February, was to obediently follow the goal defined in the project application. Although this was not as unproblematic as it might sound. Opening up the spatial plan for discussion in a digital space proved to be a problematic issue. Negotiation was ongoing.

The discussion was continued ten days later when the representatives from the municipality and the university met the software company Your Voice. The company had developed a web-based platform, called Open24, which the municipality had already tested and used in an earlier project "Val2002" [Election 2002]. At an early stage in this meeting, two questions of interest were raised in connection with discussing communication on the web: the issue of communication identified in the previous meeting and a new issue concerning presentation of the spatial plan on the project web site: "*How can one present and form information from the comprehensive spatial plan on the Internet as a complementary channel and way? " […] "And what about communication? How can we open up the discussion for the public? And also for organisations?*"[10]

In addition to the human representatives of the participating organisations (the municipality, the university and the software company), the meeting was also attended by one of the non-human project members, namely the web based platform Open24. Indeed, it was there by special invitation: the software was one of the members mentioned in the original project application and was therefore invited to participate in the project. Open24 offered special experiences and opinions in the discussion about communication on the web site. The platform Open24 talked about the readymade and available web-based modules that could be used for communication. A new problematisation that later on was present in almost all the discussions concerning the web site popped up, namely: '*Should the project demand that the web site users should register, i.e. fill in a form with information such as name, address and telephone number before they are allowed to use the communication modules?*'[11] This alternative was juxtaposed or opposed to the possible misuse of the web site if users were allowed to use the communication channels anonymously. Doubts of all kind were formulated, indicating that the ease of communication as presented in the project application was starting to show cracks, and time was needed for further negotiations. The trajectory of the project was still given and closed: the web site. The issue under consideration was the issue of communication.

How did the discussion go one week later, in the middle of March 2003, after the meeting with the company Your Voice and the web platform Open24? A new meeting was organised with participants from the municipal information office, the department of spatial planning and the university. The meeting was still about communication. A voice reminded that consensus had not been reached among the project members concerning communication, stating: "*The project is about communication. We have to make up our minds: what do we mean by communication?*"[12] Some new ingredients were making an entrance. The openness of the discussion was slowly but surely being limited, when the project members started to comment that "*We have to decide what we want to test here. What is it that the project wants to give answers to? The things we are reaching for must lead the project forward.*"[13] No more talking but decisions, seemed to be the appeal or the command. No more detours, back to the track. Order and discipline. Questions became more focused. The discussion was no longer about communication in general, but was more connected to the spatial plan. The talk became more focused when the direction of the discussion moved from communication in general to the spatial plan in particular, and even more precisely also to how the plan should be presented on the web. Here, the stabilisation became visible: from open to more focused discussions and from communication to information (although the communication theme was not excluded entirely. The original invitation, the project application, was not negotiable as a whole, which still lent legitimacy to the commu-

[7] Project meeting, 27 February 2003
[8] Ibid
[9] Project application dated 31 January 2003
[10] Voices from the meeting, 7 March 2003
[11] A voice from the project meeting 5 March 2003
[12] A voice from the project meeting 13 March 2003
[13] ibid

nication talk). However, new words started to emerge in this project meeting: easier, more effective, modules, system, spatial plan, decision.

One can start to anticipate what was happening in the communication debates. Suddenly the technology was starting to play a more precise and active role in the discussions. Although the project members were talking about communication and information, they now invited technology to join in these discussions to a greater degree. Where the project members had previously expressed loose and vague questions about the possible problems when creating communication, technology started to give proper and distinct answers: '*identification control, a discussion forum, a question forum, more effective and easier*'.[14] Technology, in the guise of Open24 in this specific context, started to act as a strong stabilising actor. But it also started to set limits. Other boundary transgressions also participated in the discussion: "*Is the web site mostly about providing information about the spatial plan or is the aim to have discussions and dialogue about the plan?*"[15], was one of the discussion issues. An actor that was always lurking in the background was administration. Many project members worried: '*What should we do with all contributions that are going to come in via the web site?*'[16]. Some of the participants were getting impatient and longing to get to grips with more concrete issues. However, the discussion about the core of the web was still open: "*Will we have more discussion just because we have a web site? What do we want to have comments on?*"[17] were questions the project members were still allowed to ask.

One day later, in the middle of the March, another project meeting took place that was also attended by the representative from Your Voice in addition to the municipality and the university members. Now there was a slightly new tone to the communication discussion: the issue of trust started to occupy the discussion space and time: '*Should we not trust everyone? There is no real reason to lie […] Have we agreed that people who want to debate on the web site should register themselves first?[…] There are some people who will want to press the system […] it is important to set limits.*'[18] Discussion of the administrative procedures concerning the incoming citizens' contributions on the web site started to take over the discussion: '*A contribution on the debate forum – is that a public document? […] What about e-mail? – Is it a public document? […] How do you sort the contributions – How do you archive them?*'[19] A move towards more focused work on the web site was starting to take form when it was decided that it would be the department of spatial planning that should react and act and choose chapters to be presented on the web site. The project meeting articulated a concern for the limited amount of time. The link to the spatial planning process time was now a fact: '*The project time [KomInDu-project] is the same as the consultation time for the spatial plan*'.[20] The meeting spoke about getting focused and organised. Things had to be done.

[14] A voice from the project meeting 13 March 2003
[15] ibid
[16] ibid
[17] ibid
[18] A sample of voices from the project meeting 14 March 2003
[19] ibid
[20] ibid

In a project meeting at the end of April 2003, the university members presented a summary of the design discussions, based on the discussions at the project meetings and the workshops organised some days earlier: *"… quantity is not essential; intensifying; simplification vs. simplicity; to create layers in the presentation texts; different grades of difficulty of the texts presented on the web; to ask questions – to re-develop the presentation text; to make space for different voices; to examine and inspect e. g. the environmental issues, entrepreunial perspectives and the point of view of families with children, the materiality of the web binds us, doesn't it?; what is the point of chat? = to talk simultaneously with many people; virtual worlds/scenarios; visualising quality, not just giving an answer but creating a virtual walk through Ronneby; which form to choose for presentations – to experiment – users should be able to make changes/draw/identify places (beautiful, ugly)/ suburbs where they do not feel comfortable; – to finds alternative ways to present – to look at and comment on other people's suggestions; take a chance to play SWOT*[21] *central; to develop in order to create space for creativity; to consider citizens as co-constructors."*[22]

This is the last time the design discussion of communication and interaction was open. The summary shows how the discussions and work that had taken place in the workshops and mock-ups[23] had inspired the project members to think about communication and interaction far beyond a text-based form of communication and the provided modules of the Open24 software. The project members sketched interactive maps, virtual walks through the town, scenarios. Being wild and serious at the same time. The idea catalogue, as represented in the summary, did not manage to be included in the project process. Time was running out, the discussions had already taken both time and effort during the spring: "*[…] The few meetings we had…they didn't really…we didn't come that far, because they…did not have the basic information. And that was the reason I was brought into the project. The whole thing was done rather hastily. And when they received my…my thoughts, with the schedule, then they could start…to finish the whole thing.…*"[24] ❑ "*I went down to Ronneby to listen to the discussions, to get an idea of what you wanted and of which direction the project was going in. After that it took rather a long time before we started to do anything concrete.*" *[…]* "*partly, there was the period before the summer, because then I worked a lot, but most of the work was done in August, in the final phase, when it [referring to the publishing of the web site] started to come closer, then there was an awful lot of work to be done during the last few weeks…*" *[…]* "*The form of the web site only became clear when I received the texts. It was the texts that steered the design of the web site…However, I had to wait quite a long time before I got the material. I kept on asking for some material…as it [referring to the web site] should have been completed by 21 May…*"[25]

[21] SWOT = Strengths, Weaknesses, Opportunities, Threads
[22] Project meeting, 24 April 2003
[23] […engougare hands-on experience, and thus support user involvement beyond the detached reflection that traditional system descriptions allow for; they are understandable; hence there is no confusion between the simulation and the "real thing", and everybody had the competence to modify them; they are inexpensive[…] they are fun to work with." (Bødker & Grønbæk & Kyng, 1993, p. 168)
[24] Interview with a project member, 4 October 2003
[25] Interview with a project member, 28 November 2003

After the meeting at the end of April 2003, the project became more concentrated. The original schedule was to publish the public web site before summer 2003. This meant that the work had to be done in very little time. At this time, the advertising company joined the project. They worked with the texts to be published on the project web site. The web design lost its flexibility at the end of April. The open discussions concerning the web site design were closed, because of the limited amount of time. There were no project meetings during the summer at all, which of course meant that the discussions concerning what the web site was all about were closed. The web site was published on 2 September 2003.

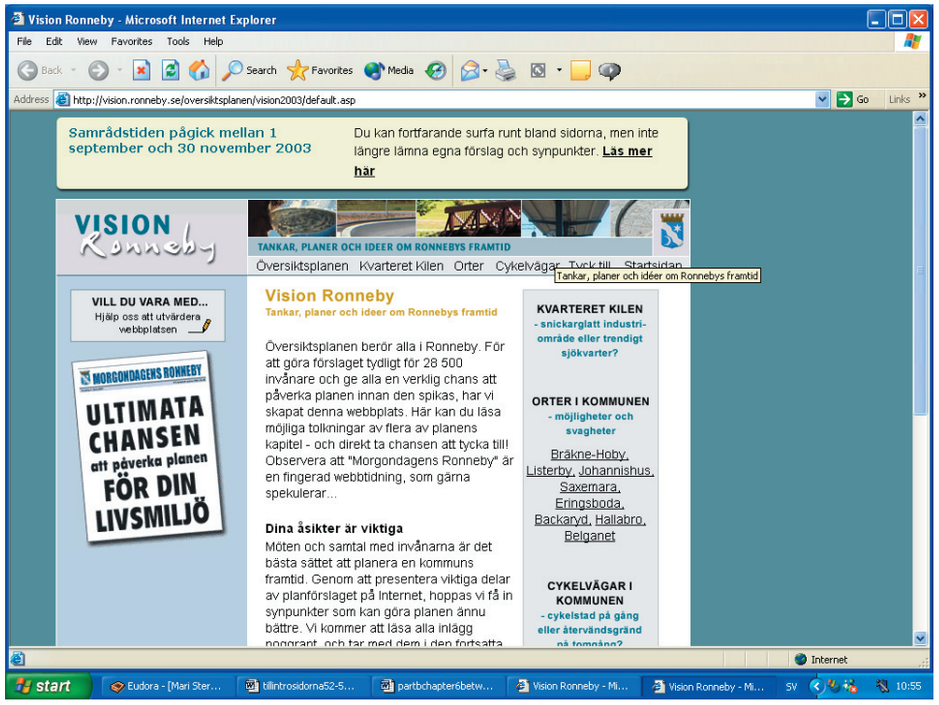

Figure 1 Vision Ronneby web site (The web site of the KomInDu project)

Time supporting and demanding stability

One of the intriguing issues in the context of the KomInDu project involves linking the discussion of stability and instability more explicitly to the issue of time. During the project, there was a great deal of talk concerning a number of deadlines, publishing dates, lack of time, delays, scheduling work assignments and so on. Time was both a resource and a problem. What kind of actor was time? What kind of work did it do for the project? Was there a connection between the possible stability and instability and time? In what ways did time eventually relate to stability and instability?

However, time is not a simple perspective to work with. First of all, it is important to remember that time comes in many shapes, all of them having their own tempo and rhythm that create orderings and at the same time demand ordering of things placed in the specific time context. When creating order, the ordering often happens in relation to time.

When choosing the form of a project, the KomInDu project also chose to anchor itself firmly to linear time, which is chronological time. It can be measured by a variety of time units, such as years, months, hours, minutes and seconds. We use our watches and calendars as tools to be able to follow time and measure it. Linear time is fixed; an hour is always 60 minutes. Another notable aspect of linear time is that it has a trajectory. We can identify when something begins and ends. And the line of movement is from the beginning to the end, and never the other way round (see e. g. Davies, 1997, 2001). The linear time is stable by definition. If the time line keeps to its own linear time flow, it gives and creates stability in the environment connected to time, but at the same time, it also demands stability of actions that are to be connected to linear time. Everything that indicates instability when interrelated with linear time is indispensably negative in itself when connected to linear time. Everyday practices have to be smooth if they want to follow linear time, and linear time has to be smooth to really exist and function in practice. In daily practices, linear time is often divided into deadlines, delivery times and publishing times. To keep to the time line, we need stability in our practices: the deadlines have to be met so that the next deadline waiting on the time line can also be kept. The time line can or must be supported by arrangements that help to follow and keep to time. Otherwise, there will be disturbances, late deliveries – what we could call negative instability. Things flow onwards.

One can also claim the stability of the project only existed on paper[26]. It was the only place where the smoothness and linearity of the linear time was given and unproblematic. The project in action showed that linear time required hard work from the other actors in order to stabilise the project. The hard work needed was done during the project meetings, where the talk about the project work that had to be done was translated into the language of linear time: deadlines, the order in which the tasks should be done, deciding an exact date for the various episodes. The time line and the project were constructed hand in hand. Time supported the project and the project supported linear time. Linear time provided support when it functioned as a skeleton and held the project activities together. Linear time helped the participants to identify when their part of the project was in focus, and they were also able to know what had happened before and what would happen after their contribution. And of course, according to the rationality of the project, the time line was the instrument by means of which the project members could evaluate what was going on, giving direction to the defined goal and providing information when there were delays and problems on the way.

The same supporting linear time was also, when things were at their worst, stress time, forced time and control time. Actions were like a string of pearls, where each pearl stood for a date or a time of day. The internal order of the pearls had already been

[26] The project application dated 31 January 2003 contains a detailed two-page schedule

decided, which meant that there were many control stations, measuring and reporting. Linear time functioned like a master deciding how the time available was to be used by each of the participants. It ordered participants' activities and demanded that they follow that order. Linear time was also constantly reminding that there was only a finite amount of it and that it had be handled with respect.

When analysing and thematising the interview material and the taped recordings from the project meetings, one can recognise elements that indicate that the linear time design process was in fact a rough, diverse and controversial process. There were several disturbances on the linear time line – disturbances that stirred and shook the stability needed for the linear flow of the work. These disturbances were related to the lack of time, delays, lack of co-ordination, unclear roles that affected the distribution of work, which in turn affected the smooth flow and also the internal and temporal order of work.

Linear time had its own complexity. It had to cope with other linear times. The most important linear time running alongside the linear time line of the KomInDu project was the overall process of the spatial planning. The planning process as a whole has already taken altogether almost five years, whereas the KomInDu project was part of the planning activities in 2003 only, which was the period of consultation. This in turn had clear implications for the content and also the form of the web version of the plan. The spatial plan proposal was already finished and fixed by the time the project started focusing on the construction of the web site. The spatial plan period of gathering information and facts was over. That process had reached its end. Or as some of the project members said: *"[…] it feels like we're in the final phase."*[27] ❑ *"We have had a long process…And it takes an unnecessarily long time, one might think. But it has been like that. There has not been any deadline from the beginning."*[28]

What actually happened was that the two linear times were merged in late spring 2003. In fact, the KomInDu project became an essential part of the spatial plan project for the period when the plan proposal was sent for consultation. This had consequences for the work flow and also for the content of the project. The consultation period speeded up the work done within the framework of the KomInDu project. The date for publication of the web site was decided by the opening of the consultation period for the spatial plan. The closing down of the web site was defined by the closing down of the same consultation period. After May 2003, there were fewer, indeed hardly any, discussions concerning how the communication proposed in the project application would be developed in a broader sense. Linear time became a limitation, but also forced the project to focus and stabilise. The focus was the spatial plan. In a way, the project changed shape, from being an open project that sought e-democracy and took the issues of communication and dialogue seriously, to being a spatial planning project that to a great extent followed the intentions of the spatial planning process. The project also turned out to be more explicitly an internal administrative project.

[27] Interview with a project member, 27 March 2003
[28] Interview with a project member, 21 March 2003

During the autumn project meetings, the emphasis in the discussions was on how and whether to deal with the incoming opinions published on the web.

Workshops supporting stabilisation?
The research representatives from the technical university all had a sincere interest in and commitment to the Scandinavian approach of participatory design (PD) (see e. g. Bjerknes & Bratteteig, pp. 73-98, Iivari & Lyytinen, 1998, pp. 135-186, Schuler & Namioka, 1993). This approach challenges the traditionally solid boundaries between the technical/design expertise of systems developers and designers on the one hand and the position of the users of technology on the other. The PD perspective calls for mutual co-operation between designers and users by bringing their competences and experience to the same table. Having this approach as an epistemological and political point of departure and at the same time consciously respecting the linear time line of the project, the research members of the project wanted to contribute to the common work of stabilisation so that the project could move as planned through linear time towards its most visible goal: the website. In concrete terms, this meant that the research partners organised workshops in order to involve the municipal partners in the design of the web site. The theme of the workshops, two of which was organised as mock-up workshops, was communication and interaction. This theme was chosen because the project in its original project description and application pointed out that "*the project is aiming to develop and evaluate methods for citizens' communication with the municipality.*"[29]
The PD approach was never explicitly present in the project application, but in a way it was smuggled into the project without being granted legitimate access. And when linear time started to remind the members that there were crucial deadlines ahead, the design discussions had to withdraw. A great deal of negotiating was needed in order to direct the work back to linear time. This required a lot of clock time, which in turn meant a decrease in the linear time available for, for example, web design. Here one has to remember that there were project partners that did not attend the project meetings or only participated very scarcely. Is this important? Might the closing also depend on other factors? Perhaps the PD approach only attracted the academics? Doubts were expressed that there would be never-ending discussions if a larger number of actors were involved in the design process: *"[…] in order to construct democratic situations…where citizens can express their opinions, then you have to decide something. But…you get stuck in a vicious circle – that is the way it works in many places, both for private companies and for the public sector, that they don't get any further than talking – then absolutely nothing happens […]"*[30]

Final stabilisation of the 'e'
Stability was not a ready, fixed and static point of departure for the KomInDu project, rather it was an effect that was constructed in the relations between the actors participating in the project process (see e. g. Callon, 1986, Law, 1987). Stabilising rela-

[29] The project application dated 31 January 2003
[30] Interview with a project member, 14 October 2003

tions was a necessary goal for the project, but the road to stability was not mapped in advance; instead it was created in pendulation between stability and instability. Even if all the actors were committed to the project goal by accepting the project application and being enrolled in the project from the very beginning, the application remained open to interpretation even after the project was started. The interpretations were shaped and tested in the project negotiations that mostly took place in the project meetings, but also in the workshops, everyday practices and work.

The communication and interaction that were to be shaped on the project web site were the main concern for the stabilising discussions. These discussions were open, with space for a variety of meanings and understandings that were also strengthened in the workshops and mock-ups organised during the project. However, one of the non-human actors, namely linear time, started to push the project towards stability in an alliance with the software Open24. Neither linear time nor the software was eager to or capable of participating in the open and seeking discussions of communication and interaction on the project web site; instead they were more focused on achieving final stability – the publishing of the web site.

The project reached its 'e' goal by creating enough stability between the participating actors. The web site was constructed and published inside the framework of the allocated linear time. However, this required a lot of hard work, discipline and control. If we regard the web site as a result of stable heterogeneous network relations, there had to be participating actors in the network construction that built up and strengthened the stability required. At the same time, the combination of linear time together with other actors striving towards stability meant that open negotiations and translations had to be stopped at a certain moment. This in turn meant that other options and alternative solutions for how the web site should be built up were excluded.

The discussions concerning how the communication and interaction aspects formulated in the project application should be translated into the functions on the project web site were very open and negotiable in the early stages of the project discussions and throughout the interventions that took place in the workshops and mock ups. But there were three non-human actors in particular that were the main stabilising agents: the spatial plan proposal, linear time and the software Open24.

The spatial plan gave the KomInDu project a very well defined content and goals that had been negotiated and stabilised in another context outside the project in hand. It also brought previous understandings as well as practices of communication and interaction with the citizens to the project – practices that were stable and that needed to be kept stable in some way in the KomInDu project. The stability of the spatial planning process and the stability of the KomInDu project were closely interconnected.

The enrolled linear time provided only a certain amount of time for the project. As time passed, the amount of time left decreased, meaning the negotiations became increasingly closed. Time also functioned as an obligatory point of passage through which other resources, such as money, had to pass. And money, in turn, determined how much effort the human actors could put into the accomplishment of the project assignment. Time and money as actors influenced each other and were mutually dependent on each other. A double passage point was created (see e. g. Callon, 1986).

The third effective and strong non-human actor in the process of closing the discussions and creating stability was the technical platform, Open24. In this specific case, there is reason to doubt that it was the main technology actor, the Open24 software, that pushed and forced the web site solution to go in a certain direction, aided and abetted by linear time and the spatial plan proposal. The technology present was in itself a result of previous network relations that had taken place elsewhere and then been transported to the KomInDu project. This resulted in the prior black-boxing (Latour, 1999) of the chosen technology, in the shape of the Open24 software, and understandings and interpretations of what communication and interaction in a municipal context are all about The meanings of the notions of communication and interaction were thus sealed. When the 'inevitable' understandings and interpretations of communication and interaction get materialised in technological solutions, they bring with them the dreams of actors that are absent in the present project (see e. g. Mörtberg, 2003), and materialised dreams are durable (see e. g. Law, 1987) and not transformable and translatable when transported into other contexts.

4. Instabilising? – Negotiating Citizenship and Democracy

The project had as its core theme communication and dialogue between the municipality and the citizens as defined in the project application, which also became the core theme when the democracy part was created. One of the most important aspects of the democracy negotiations that took place in the process was related to the notion of citizenship. There were many different voices and a great deal of disagreement about the notion during the project discussions. *"We reach few people in a dialogue. Even though we invite so many…and on several occasions…. Well, people do care, but as long as things are running smoothly, there is no immediate interest. Look at how people live and their houses. I mean, it wouldn't look like that if they really cared." (The interviewers: Is it possible to plan for a massive public opinion? [referring to a previous protest movement in the city.]) Yes, it is, if you can affect people. Especially if people feel like their immediate environment is changing in a negative and threatening way. If we said that we want to tear it all down, then everyone would have said: 'what the hell is going on?' There have been discussions on how to make the web active…I think one needs to be provocative, to some extent." […] "This is a new medium. There are very high demands that it should be attractive. There is a kind of blind assumption that a pretty picture will make people willing to write and take part. I don't believe in that at all! I don't do it myself and I don't think other people do that either. I mean, I don't want to write down my intentions just because someone has published a nice map or something, it is not that that makes one…it should be something that involves you emotionally"* [31] ❑ *"I think people are as active as they have the energy to be. What you manage to do, what you prioritise and feel for. But I think that people might be sympathetic to issues like these from a political perspective. Just because you hear about the gap between citizens and the elected politicians. And that you*

[31] Interview with a project member, 21 March 2003

for political reasons take this seriously." […] "Trust is an important word in this context. Then it is about bridging gaps, but then other efforts are needed too. There is also a risk that this kind of initiative can make the gaps in society wider." (The interviewers: You mean the people who have access to technology and the skills to use it?) "Yes, both skills and access. And willingness and knowledge…" [32]

The discussions of citizenship were also a way for the project participants to step into a dialogue with some of the ways that the term and notion of citizenship had been discussed and ordered in other contexts. Traditionally, there have been two main approaches to citizenship articulating the relation between the citizen and the governmental authorities: the rights approach and the obligation approach (Lister, 1997). The rights approach emphasises the idea of the citizenship as a static state of a person; one is a citizen by legal definition through a formal citizenship and thereby the citizen has legal rights and access to the services provided by the authorities. The obligation approach emphasises the idea of an active and participating citizen, even if in different political contexts the idea of obligation has been interpreted in numerous and perhaps even contradictory ways (Lister, 1997) on a scale from participating in political decision making to working to get access to for example social rights.

Relating these two main ideologies of citizenship to the Swedish tradition and practices of citizenship, the dominating approach has been the rights approach with a very strong Swedish connotation to the 'folkhem' ideology[33]. This ideology has guaranteed access to political and social rights and services for all groups of citizens. The Swedish welfare ideology and practice has laid great stress on regarding citizens as a collective, as categories of citizens (children, teenagers, senior citizens, families, single parents). During recent years, a clear shift to a more individualistic approach can be identified, for example in IT-political documents.[34]

In the KomInDu-project discussions, the movement towards a more individualistic perspective of citizenship was apparent. Already in the project application, the meaning of citizenship was understood as the active, communicating and interactive citizen in the development of the new digital services, even though thinking based on regarding citizenship as a category of a collective group of people popped up now and then in the discussions. For example, the project participants were concerned about the passivity of the middle-aged family parents and younger people. The shift from being a citizen to acting as a citizen was not clear and unproblematic, but rather was subject to a diversity of understandings and meanings.

[32] Interview with a project member, 17 April 2003

[33] About the notion of 'folkhemmet': This has been the ruling social democratic ideology in Sweden since the Second World War and has roots that can be traced back to the 1920s. It is commonly known as 'folkhemmet' [the people's home] (Hansson, 1935). The main characteristic of the 'folkhemmet' ideology has been to build up a strong welfare system that guarantees social benefits, such as child care, health care and school education, for every member of society.

[34] See e. g. Regeringens proposition 1999/2000:86, SOU 2003:55

The rights and obligation approaches can also be connected to the development of democracy as a whole. If democracy is mainly understood and realised, from the rights approach, as service delivery and thereby as access to the rights provided by the authorities, then even e-democracy has turned out to be eager to provide services – this time in a digitalised form. The ground rules and possible changes and alternatives of the meaning and practices of democracy have not been considered. The goal has become to continue along on the same old track. However, the obligation approach can be translated into concrete practices of a participating citizen, as articulated for example in the Swedish government bill from 2000: "*The development of the Internet opens up new possibilities for public control and dialogue, direct democracy and control by the citizens. The dialogue on these [virtual] arenas can change the possibility of the citizens to gain influence….*" (Regeringens proposition 1999/2000:86).

But what would this participating democracy of a new kind be like in a digital space when we do not yet have it in the physical space, if by participating democracy we mean something other and more than representative democracy. Participation has to be created and shaped in concrete practices, and the shaping includes also daring to experiment, as intended in the KomInDu project.

The project as a whole constituted a space for negotiation. Did the stability of the project become shaky and thus put the success of the entire process at risk because the project members had different interpretations of democracy and citizenship? Or could the open-ended negotiations be understood as a part of necessary and thereby positive instability? Or did the project want to emphasise the national rhetoric and how to translate it, that is, to contextually locate and situate it, so that the rhetoric can turn out to be committed, situated and accountable interpretations and hopefully also in the long run sustainable and existing translations of democracy, surviving after the short lifespan of the KomInDu project? If the web site was an example of a network where relations between the actors have to be immutable, perhaps the democracy part of the project was an example of network relations based on fluidity, where fluidity is a figuration telling about things that partly keep their shape, but when transported also change their shape – and where the very transformation is a precondition both for transportation and for creating durable relations and networks, such as the notion of democracy (see the discussion in Law & Mol, 2000).

5. Paradoxes in the project

Being an e-democracy project situated in the space between the letter 'e' and the word 'democracy', the project had an inherent paradox right from the very outset. The paradox was connected to the relations between stability and instability. There was the 'e' part that both demanded stability and could be stabilised, and there was the democracy part of the project that cannot and should not be stabilised. The project provided a space for negotiating how e-democracy could be shaped and made in the specific local context, in the municipality of Ronneby. Negotiations were not intended to reach the final goal of providing a definition, answer and mutual agreement as to what e-democracy is. The negotiation space was open, not fixed, and provided space

for negotiations that were not looking for final answers but were perhaps asking new and unexpected questions.

However, stability and instability were not separate units isolated from each other. They were interwoven into each other: "*…we cannot think only in clocktime and in linear time, but our lives are a complicated weave of different actors and relations.*" (Davies, 1997, p. 16).[35] There was no pure doing and action during the project without reflective discussions, as the discussion concerning the design process for the project web site in particular clearly shows. In order to create stability, reflectivity was also demanded and needed. However, this reflectivity was tied to the needs of the concrete assignment and had to be adjusted and linked to construction of the linear flow of the assignment. In spite of their rigidity, the stabilising processes created space for thinking about the everyday work. The boundary between stability and instability proved that the positions are not a choice of either–or, but "*borders are fluid and it is difficult to know when some actions have started or finished.*" (Davies, 1997, p. 23). Thinking does not always get or take the time needed because "*thoughts take time, and space for this work – both in terms of a separate time period or a separate place – is often limited in women's [PE's comment: in all] jobs*" (Davies, 2001, p. 142). One of the project members expressed the added value of reflection: "*Then there is another dimension too, the parts that you stand for. Different eyes… You watch us and all that. It is some kind of contact that…could have been very fruitful, or how to say it…also in our daily work. One should reflect upon things a little bit. It is a pity that it is just this. Because one realises that when this is gone, then it is gone…but I think, generally in the public administration, it is useful to have this kind of reflection.*"[36]

This reflection was tolerated up to a certain point, because it strengthened the stability work done, the construction of the web site. Did the discussions concerning democracy, citizenship and information technology contribute anything other than 'noise' to the project? Were these discussions necessary?

There are at least two reasons to answer 'yes' to this question. If the intention of the project was to link together technology and society, expressed through the phrase 'e-democracy' in the project context, there had to be space for both stability and instability. The spaces were partly intertwined in the actual process, and the technical and the societal were not spaces with fixed separating boundaries. We know very well from other experiences that "*[…] these two dimensions – device and meaning, technical and lifeworld practice – are inextricably intertwined….*" (Feenberg, 1999, p. xii). Technology is not only objects, artefacts and software, but is more of an amalgamation of heterogeneous practices, sometimes materialised in objects or, as Judy Wajcman says, technology is both "*a form of knowledge, …human activities and practices…and physical objects…*" (Wajcman, 1991, p. 4).

[35] Underlined words are italics in the original text.
[36] Interview with a project member, 21 March 2003

Even if we know this from our own everyday experiences, we nevertheless seem to create other kinds of boundaries between the domains of technology and society. Even in this project, a boundary was established and preserved between a small project, to construct a web site, and large distant discourses of democracy. Discourses were considered to have been developed somewhere else, far away from us, in the realm of national and global politics. A boundary was partly kept between creating something new and working with something that was already defined both in theory and practice, regarding both technology and democracy. Transgressing these boundaries was the central issue for discussions, causing instability when travelling to and in the space in between and trying to explore and make the topology of the project visible. In a topology, distances taken for granted become surprisingly different; what is faraway and what is close are not necessarily that sure and defined: "*If you take a handkerchief and spread it out in order to iron it, you can see in it certain fixed distances and proximities. If you sketch a circle in one area, you can mark out nearby points and measure far-off distances. Then take the same handkerchief and crumple it, by putting it in your pocket. Two distant points suddenly are close, even superimposed. If, further, you tear it in certain places, two points that were close can become very distant. The science of nearness and rifts is called topology, while the science of stable and well-defined distances is called metrical geometry.*" (Serres & Latour, 1995, p. 60).

The second reason to answer 'yes' to the above question is because instability in the shape of discussions, debate and dialogue is necessary if we want to learn to co-operate and collaborate with people from different knowledge practices, all of whom have their own dreams of the good life. The project as a whole was an opportunity to learn about those really tricky assignments in a world where boundaries between different knowledge practices, skills and competencies, such as, for example, those between technology developers and users, have been one of the fundaments of western society. The assignment given to the project to work with was formulated as: "*How can people rooted in different knowledge practices 'get together', especially when all-too-easy cultural relativism is not an option, either politically, epistemologically, or morally? How can general knowledge be nurtured in postcolonial worlds [my addition: in other worlds too] committed to taking difference seriously?*" (Haraway, 2003, p. 7).

Lucy Suchman says: "*The problems that interest us include the practicalities and politics involved in attempting to reconceptualize and restructure the ways in which work and technology design are done.*" (Suchman et al., 1999, p. 399). Her words were interpreted in the KomInDu project as formulated goals for the negotiations taking place during the project. Concepts and words we worked with in the project had to become committed, and situated, such as concepts of communication, democracy, citizenship. When concepts and words are committed, they are situated in the specific practices of work, design, technology, politics and research. Commitment and situatedness are in turn prerequisites for sustainable sociotechnical development. The participants have to be as committed as the concepts and words – and not only the human participants, but also the non-human participants. If this is the case, the option of "*design from nowhere […] closely tied to the goal of constructing technical systems as commodities [and*

design of democracy as well][37] *that can be stabilized and cut loose from the sites of their production long enough to be exported en masse to the sites of their use*" (Suchman, 2002, p. 95) does and should not work anymore.

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Part C – Epilogue

To the Reader

Each of the diffracted stories told in the previous part of the dissertation is of course specific and unique with its own actors, context, location and situatedness. But the stories are also connected through deconstruction, Actor-Network Theory, feminist technology and technoscience studies.

My intention is, taking my point of departure from present stories and their connected themes, to take a step further into the stories and practices not yet existing and discuss if my research discussions, analyses and problematisations could be transported and implemented in practices to come. I also introduce the figuration of an angel as the cartographer and (co-) constructor of new sociomaterial relations.

[Translations from Swedish to English are made by the author.]

1. Circulation, Communication and Connections – Angels in Sociomaterial Relations

The reader: "Why should we be interested in angels nowadays?"
The author: "Because our universe is organised around message-bearing systems, and because, as message-bearers they are more numerous, complex and sophisticated than Hermes, who was only one person, and a cheat and a thief to boot […]." (Serres, 1995, p. 293)

So Far… – The Stories of Information Technology

My journey has reached its end. Actually, it might be more appropriate to say that it has reached its end for the time being. It would be even more appropriate to say that I am simply taking a break from travelling. It is time for a reflective pause and time thus to ask: Where have I been? What happened during my travel? Did anything unexpected happen? Did I see anything that surprised me? Were my research questions as discussed in the introductory chapter relevant and adequate? In other words, it is time to summarise my efforts.

The first story from my travel, 'Discourses and Cracks', is told from the perspective of the project leaders, being one of them myself. The project was partly about teaching and learning computer know-how: skills of how to work with a computer and how to use the Internet and a number of standard computer programs. And it was partly about developing the voice of an active citizen by giving personal life histories a face, a body, a manifestation on the web. To find, develop and practise a voice of one's own, in the physical room together with the project leaders and other project participants and also in the public room, by having dialogue with people living in other countries and by raising one's voice in the political room created for the citizens and local politicians. The agency was multi-layered: how the project leaders understood their own agency as developing a dialogue with the 'all are invited' slogan articulated in a number of political documents. The agency of the participating women was also under consideration and how the agency was understood by the project leaders. Was it interpreted from the perspective of empowerment, creating an arena for women's own voices, noisy in the private rooms but invisible, absent and silent in the public rooms? And/or once more having a perspective from outside and categorising women as a homogeneous group with special needs and solutions tailored for them? And/or negotiating about the meaning of the notion of 'all'? And/or negotiating about the meaning of the border between a user and a developer in the world of information technology? And/or was it about creating located information technology where technology and society were interwoven? I would say that the project was an exercise in learning to live in the tension between all these issues, living at the intersection of all these questions. The project was a dialogue about democracy and how to be(come) a citizen – not a universal one as implicated in the discourses of democracy and information technology, but a situated and located one. The discussions were about how to relate oneself to the invitation to 'all' if one at the same time belongs to the 'not-all-ones', as defined in both historical interpretations of citizenship and local practices of representative democracy. The project was thus trying to start to find spaces for a notion of citizenship that includes heterogeneity and individuality, but does not exclude the collective actions of groups of citizens either.

The arena in the second story 'Translating and Negotiating Information Technology' was a regional information technology project for public libraries (the Bruk project). There were things that surprised me when working on this project and trying to find out what happened during the project. Initially, I thought the project was simple and one of numerous information technology projects taking place in south-eastern Sweden, in the county of Blekinge at the end of 1990s. The reason I had chosen to study this specific project was that it was initiated and carried out by librarians. One of my research goals was to see what the IT agency of librarians would be in other contexts than in my own personal working life contexts. My aim was to render visible the invisible actors of IT, excluded in the political documents I studied. A secondary goal, interconnected to the theme of invisible actors, was to study how information technology was understood within the project, to see how understandings and meanings were created. The actors entering the scene were a large number of computers, computer networks, servers, money and project documents. There were also numerous people in addition to the project members, such as entrepreneurs in small and medium-sized businesses, students and senior citizens. There were connections and tensions between investments in information technology and the traditional history of the public library ideology.

Parallel to studying this specific project and its IT translations and interpretations, I also interviewed two librarians working on other projects labelled as IT projects. The same thing happened in these interviews: there was a lot of talk about computers and servers, but also about the people connected to the project. The richness of the stories was evident. Evident were also border transgressions of expertise that the librarians were involved in. The problems I faced were about how to bring all the diverse elements together – trying to find a way to include people, artefacts and other materialities. It was here that Actor-Network Theory (ANT) provided an analytical perspective that made it possible to include both humans and non-humans in one single story of information technology. ANT also enforced thinking about information technology more as relations that were both social and material, indeed sociomaterial. The goal of the classic ANT approach is usually to focus on how the sociomaterial relations, or networks as they are often called in the ANT context, reach their stabilisation. This understanding helped me to recognise the negotiations going on that were both pushing and being pushed in one and the same direction: the project did what it was designed and financed to do. At the same time, there were elements in the interviews that did not fit into the story of striving towards stabilisation. There were tensions, contradictions and invisible actors disturbing my story. In order to create space for these voices too, I decided to include thoughts and suggestions from Actor-Network Theory and After (ANTa) metaphors and their sensitivity to disturbances. Besides the smooth and functional story, another story line of roughness was also included. The story as a whole thus became an experiment in transgressing boundaries on two levels: first, transgressing the border between technology and society, and second, transgress-

ing the border between stability and instability. The experiment was to learn to live with and think through hybrid creations, of which Donna Haraway's cyborg is one of the most challenging.

The third story 'Negotiating Information Technology' and the fourth story 'Making e-Government happen' belong together. I followed the construction of a web site through the eyes of a municipal web developer. Here I continued the stability/instability discussion started in the second story using the ANT/ANTa approach. I connected the local work to a national IT-political document manifesting the Swedish political goals for information technology. I also studied a local IT-political visionary document and found themes interconnected to each other: maintaining the welfare state/municipality, but also signs of change in the Swedish approach of citizenship traditionally based on equal rights for all citizens. There was a slight change of tune that was starting to articulate a new kind of agency for the citizens: an active, participating citizenship based more on individual citizens' actions and preferences. In order not to remain mere rhetoric, the political goals have to be translated, for example to web-based services of municipalities. This was the work to be done by the web developer that the story is about. The stability formulated in the political documents met the instability of everyday activities shaped in the relations of humans and non-humans. The case of the web developer demonstrates that it is possible to live in both spaces – spaces of stability and spaces of instability – at the same time. However, the instability needs to be made visible, partly in order to promote reconsideration of the notion of design and more precisely the context of design of information technology. The question now is: How to bring the heterogeneous actors to design? In the third story, this question is discussed in a collection of vignettes where the stories are from different contexts but which all share the common theme of participation in design and actors of participation.

The fifth story 'Citizens at the Crossroads of Multiple Layers of Sociotechnical Relations' visits the 'parliament of things' and presents some of the sessions that have taken place there. In the three sessions chosen for this story, the participants are information technology, the Swedish national agency of social insurance, the Swedish government and a citizen. The authors investigated how the heterogeneous assembly of the parliament of things creates citizenship and democracy in integration with information technology. What are the spaces for action and what are the limits of action in a context where the agency of citizenship in a democratic and technological society is under consideration. This story develops further the design discussion initiated in previous stories and suggests an expansion of the Scandinavian approach of systems design also to embrace non-humans as actors. The story suggests a more cyborgian turn in the Scandinavian approach.

The sixth, and final story, 'Between Instability and Stability', is about a local e-democracy project. In this specific project, the goal was to create a web site where the citizens could find information about the comprehensive spatial plan under construction. However, the web site did more than simply present the plan; its main focus was communication and interaction concerning the actual spatial plan. The project had

a suit of (web) technology and democracy, a suit of creating agency and space for an active citizen. When analysing the ongoing processes, both as a researcher and as a project member, I found I had returned once more to the tension between stability and instability. Was there an irresolvable discrepancy between the two notions, 'e' and democracy, or would it through open negotiations be possible to live in the tension was the question the project evoked. I tried to move in the topology of the project and listen to the noises necessary to keep the participation and negotiations open. I also returned to the non-human actors. How did they participate in the negotiations? I worked with verbal dichotomies such as instability/stability – not in order to reproduce and reinforce them, but rather to visit and investigate what happens in the spaces in between, such as that between the letter 'e' and the word democracy and between stability and instability.

Surprised – The Interconnected Themes

After visiting the places, talking with people in interviews and otherwise, and reading texts, I can state that the complexity of information technology in this collection of stories amazes me. Information technology both keeps its shape and changes its shape in its situated contexts. Information technology seems to be willing to attach to numerous networks and relations: sometimes it is done in libraries, sometimes in schools, sometimes in the municipal spatial planning offices, EU projects and municipal IT offices, as in my stories. It is done by librarians, project leaders, web developers, citizens and politicians. It is also done by computer networks, software, web technology, project applications, money, political texts and IT studios. It is done smoothly. It is done in frictions and roughness. What is most amazing is that information technology is done in 'both and'. It is done both by humans and non-humans. It is done in all kinds of places, practices, projects and situations. It is done in negotiations that are smooth and rough at the same time. There is more space for numerous agencies than I could possibly have imagined before starting my travel. The invisible actors that are excluded from official speech create space for challenging border transgressions. The political goals start to live in local practices. Things happen. Projects get initiated and finished. Web sites get planned and created. Discussions of democracy and citizenship take place. Practices that seem to be new can be connected to people's existing practices, skills and experiences. Humans and non-humans seem to be capable of living and working together. Stability and instability co-exist.

Questions have to be asked. Do I really want to suggest that the topology of information technology consists only of calm relations, harmony and understanding? When reading the summary above, one is struck by the atmosphere of collaboration I seem to be preaching. Did I really end up at the conclusion, when finishing my story telling, that anybody with enough enthusiasm and skill can occupy a place of action in the landscape of information technology? That all meanings and interpretations are regarded as equal? That there are actually no invisible actors in information technology, as I initially wanted to study? That the results of negotiations, regardless of whether they are about citizenship, democracy or web site construction, always come to a result that is mutually accepted and shared by all actors? Am I really claiming that humans and non-humans have learned to discuss, negotiate and work together?

I want to propose two answers to these serious and important questions. The first answer is connected to the story telling and my decision to use ANT as an analytical perspective. Following both the external and internal criticism levelled at texts written from the ANT perspective[1], I find I have to agree with the critics. ANT stories are functional stories of sociomaterial relations of humans and non-humans. The very idea of ANT is to provide a perspective to talk about actors who share a common wish and ambition to reach something, be it an electrical car as in Michel Callon's famous article (Callon, 1986) or a web site for a municipal e-democracy project as in one of my stories. A necessary prerequisite for reaching the mutual and shared goal is that the relations between the participating actors are stable and immutable. At some level, all network relations, or at least those that manage to accomplish their construction, are functional. By choosing the ANT perspective, one thus not only chooses to include the non-humans and talk about heterogeneous sociomaterial relations focusing on the 'how' history of the network construction. ANT-based stories are stories where there is only room for one direction, namely forwards. One also always chooses to exclude something else, as so brilliantly pointed out by Susan Leigh Star (Star, 1991). In my writing, I have tried to be sensitive to the aspect of exclusion and, by virtue of my position as the storyteller, actually having the ultimate power to include the excluded. This sensitiveness is provided by the further development of ANT, called ANTa in this thesis.

As the second answer, I want to make a slight adjustment to my analytical perspective. I want to keep the idea of information technology practices being 'both-and' practices with socio/material, humans/non-humans, roughness/smoothness and inclusions/exclusions. However, I also want to think that the border between 'both-and' and 'either-or' can be extremely narrow, diffuse and complicated. Sociomaterial can easily become socio and material, a separation that in turn has consequences when we think about possible actors and their skills and expertises. It also has a consequence in keeping the technical and the social apart in various technology development contexts. 'Both-and' thinking and working seriously with it in order to develop sustainable and accountable information technology practices presupposes conscious and distinct choices, choices that are based on negotiations demanding articulation and visualisation of the complexity lurking in all dimensions of information technology. If there are no sharp and challenging methods to keep things close and near to each other, so that sociomaterial relations in all their shapes and with all their heterogeneous participation are supported, then there is an obvious risk that 'both-and' will remain a random-based surprise.

I want to conclude my thesis by introducing the idea of sharp and distinct methods to be tested and implemented when constructing sociomaterial relations.

Things to Come – Implosion

In the introductory chapter of this thesis I formulated my final research question as follows: "The final research question is about the connectedness of the actors and arenas of information technology in the sociomaterial relations of information technology. This question sprang forth from my working life experiences and the practices studied and reported in the stories told in this thesis, where each story not only provides a description, but also carries its own analysis. I ask whether it would be possible to develop a perspective of integration when shaping information technology in everyday practices by using the methods of thinking provided by feminist guiding figurations together with the analytical and methodological perspective of ANT/ANTa. My intention is to discuss whether the methods of research implemented in my thesis could be adapted not only as research methods, but also as development methods in IT practices, in my case in the public sector." Is it possible from these points of departure and from studying past or present sociomaterial relations of information technology to move to construct coming and not yet existing relations? (see also Cronberg, 1999).

In this final chapter, I want to propose that information technology understanding based on experiences from information technology design and use as presented in this dissertation together with a feminist technoscience perspective not only can but should return to practices outside academia. I also want to suggest that there is a need for some specific competences and experiences when information technology and use is done within the following suggested perspectives:

- Information technology gets created and shaped in various and diverse multiple, situated, located and partial practices
- These practices are made of relations where both human and non-human actors participate
- To act in these heterogeneous relations entails continuous negotiating work
- Negotiations concern issues of time, resources, knowledge, experience, skills, spaces, practices, politics, expertise, computer software and hardware, web pages, democracy, citizenship, change, agency, design, computer network
- Practices are simultaneously 'both and'

Something is needed to build up the sociomaterial relations of information technology that sews all the aspects listed above tightly together. What is needed is a new figuration of thinking that is used to moving inside the sociomaterial relations, acting in the spaces in between – what ever they might be – and also capable of asking how much space there should be in the spaces in between before the spaces that are meant to be connected start to glide apart. A figuration who can move between the actors in order to assist in constructing not random-based sociomaterial relations, but sustainable and accountable ones. A figuration who knows the difference between 'both–and' and 'either–or' and who also knows how frail the difference can sometimes be. A figuration who is not afraid of border transgressions, but rather who expects and demands them.

[1] See the discussion in Part A, Chapter 2 of this thesis.

This is exactly what angels[2] are specialised in working with. They are messengers specialised in *circulation, communication and connections* (see e. g. Serres, 1995). Angels are interesting in this context due their competences, experiences and knowledges. I am not looking for angels to protect the sociomaterial practices, as a kind of guardian angels following our every step. I am looking for a figuration with whom we can learn to think about and to work in information technology development as a construction of heterogeneous sociomaterial relations, where 'both and' is the very foundation of construction work.

Angels have a threefold assignment. First of all, they have the knowledge, capacity and experience of keeping the social and material so tightly interwoven that there is not even space for a hyphen: to assure that the interconnection of the sociomaterial is maintained. Secondly, angels' work includes initiating new sociomaterial relations that often have the form of a project in a working life context. When circulating in the sociomaterial worlds, connecting and communicating with the actors of information technology, angels can be in charge of both doing the cartography of the relations and also deciding the size and topology of the new maps. Angels have knowledge about connecting people, technology and politics, which is one of the starting points of the cartographic work. Thirdly, in this cartographic work angels have a special assignment: to ask questions inspired by feminist technology and technoscience studies. Who are the actors (both human and non-human) to be connected to the current information technology practices? Are they actors that are too invisible and absent in the existing sociomaterial relations? Are there actors with skills, experiences and competences that are not the ones who are the self-evident actors? How are non-human actors connected to humans? Are all actors available to communicate with each other? What needs to be circulated?

Thus, angels do not circulate, communicate and connect only among themselves; rather they have a conscious approach to the task of being responsible for accountable and sustainable relations. In these relations, noise is also part of angels' work. When looking for roughness, tensions and contradictions, angels are not always that easy to get on with. They ask questions that might be unexpected and troublesome for some, because their questions do not take the present arrangements for granted. Finally, angels are also capable of travelling in cyborgian worlds, entailing that they can think beyond what is already known and lead actors of sociomaterial relations to unknown terrains. They create new spaces and new connections. Angels are agents of change. They know when to support stability and when to support instability. The list of the tasks assigned to angels cannot be listed exhaustively here, because their tasks are always situated and located and are not universal and general.

Angels can sometimes take the form of human beings living in sociomaterial relations. During my research, I have met many angels. Sometimes they work as project managers, librarians and web developers, as in my stories. Angels can also assume the shape of non-humans: *"…Unlike you I see something in all that transmission of things. I see angels […] Air hostesses and pilots; radio messages; all the air crew just flown in from Tokyo and just about to leave for Rio: those dozen aircraft neatly lined up wing to wing on the runway as they wait to take off; yellow postal vans delivering parcels, packets and telegrams; staff calls over the Tannoy: all these bags passing in front of us on the conveyor; endless announcements for Mr X and Miss Y recently arrived from Stockholm or Helsinki; boarding announcements from Berlin and Rome, Sydney and Durban: passengers crossing paths with each other and hurrying for taxis and shuttles; white escalators move silently and endlessly up and down…Don't you see – what we have is angels of steel, carrying angels of flesh and blood, who in turn send angel signals across angel waves…"* (Serres, 1995, p.8)

Angels can also be figures of thinking when discussing information technology projects, design and use. But to date, I have met only few angels who have taken her/his/its point of departure from thinking of information technology as unstable sociomaterial relations with a perspective from feminist technology and technoscience studies. But I am convinced that those special angels would have a lot of work to do in projects where technology, people and politics are involved, as is the case in most projects starting with the letter 'e'. Angels ask what happens with the relational information technology in all its diversity and heterogeneity when it moves into the public sector and changes its name to 'e' with all its present variations, such as e-government, e-services, e-democracy? (See e. g. SOU 2003:55, Lundgren, 2003)? My most recent experience and experiment of working from an angel perspective, are connected to the planning of a new educational programme for e-government. How to integrate and bring together the social and the technical, people and organisations, citizens and politicians, ethics and politics, efficiency and care are the kinds of questions that angels ask. And they are also questions that angels work with, so perhaps the educational programme is actually a project of 'angelology'.[3]

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The angel figuration works equally well when building up an R&D division for technoscience at a technical university with its aim of becoming skilful in border transgressions and moving in and between different worlds of knowledge productions and producers. Aiming to find connections, making thoughts and doings circulate in discussions, and learning to think about the sociomaterial not only as an analytical perspective but also as a world to live, think and act in.

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[2] My thinking of angels has been inspired by Serres (1995), Brown (2000)

[3] Borrowed from Brown (2000)

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Abstract

Angels in Unstable Sociomaterial Relations: Stories of Information Technology

Pirjo Elovaara

I have explored spaces, where negotiations of border transgressions take place and where issues of technology and politics mingle. We meet a diversity of actors in the world of information technology (IT): political texts, people and technology participating in numerous sociomaterial relations. Time is the end of the 1990s and the beginning of the new millennium, 2000. Years, when IT occupied the western world and created its own fuzzy discourse. Years, when IT stole the biggest newspaper headlines and years, when IT became a mundane everyday part of our work practices. Years, when we learned to live in heterogeneous worlds.

Actor-Network Theory (ANT) and Actor-Network Theory and After (ANTa) provide analytical and methodological perspectives when working with the empirical material. I present a chronological exposé of some of the key concepts of ANT and ANTa. I also discuss how the classical ANT perspective has changed during the last few years from being a theory of networks to become a methodological and analytical approach to other kinds of spaces such as fluid and fire.

The heart of the thesis consists of six empirical cases. My aim of writing stories of information technology has been to investigate the black box of information technology. Investigating includes also efforts of opening. Concepts that are taken for granted, such as the very notion of information technology in my case, can be explored, questioned, transgressed, blurred and opened up. Each of the diffracted stories is specific and unique, with its own actors, context, location and situatedness. But the stories are also connected through ANT, and feminist technology and technoscience studies.

Case number one, '*Discourses and Cracks – A Case Study of Information Technology and Writing Women in a Regional Context*', is about a project, where questions concerning discourses of information society with a special focus on citizenship are discussed and where global and national politics are translated to local and situated practices.

Case number two, '*Translating and Negotiating Information Technology*', consists of two main parts. The first one is about a regional library project. The analysis of the project is based on the classical Actor Network Theory (ANT) approach that invites the study of the heterogeneous and negotiable shaping of IT. The second part is about librarians developing web-based services. The analysis is inspired by the later development of ANT (called ANTa in the thesis) in order to include more invisible actors, relations and negotiations.

Case number three, '*Negotiating Information Technology: Politics and Practices of The Public Sector Web Production*', is about work practices of a municipal web developer, through which creation of sociotechnical relations of everyday information technology practices is analysed and also mirrored to national and local IT politics.

Case number four, '*Making e-Government Happen – Everyday Co-Development of Services, Citizenship and Technology*', is presenting the same web developer as in the third case, but now his everyday practices are connected with an expanded and wider circuit of co-constructors of information technology. The text is a co-production of a multidisciplinary research group aiming to describe, analyse and problematise connections when creating practices, where technology and society collaborate.

Case number five, '*Citizenship at the Crossroads of Multiple Layers of Sociotechnical Relations*', enrols technology as an active actor in the construction of citizenship in an IT context in Sweden. The perspective emphasising the active agency of non-humans both enhances and challenges the Scandinavian approach of systems development by suggesting a direction towards a cyborgian approach towards technology design.

Case number six, '*Between Stability and Instability – a Project about e-Democracy*', takes its point of departure from a small-scale project having as its goal the development of e-democracy in a municipal context. In the text the focus is on the stabilisation processes in shaping the technology ('e') and democracy parts of the project. I also discuss what kinds of spaces exist in between (the hyphen in e-democracy) and ask if integration between technology and democracy is possible as a whole.

Finally, my intention is to step further into stories and practices not yet existing. Inspired by the French philosopher Michel Serres, I introduce the figuration of an angel as a cartographer, intermediator and (co-) constructor of sociomaterial relations. Angels are needed to sew the separate fields of technology, politics and everyday practices to a rich seamless tapestry. They are the 'artful integrators' (Suchman).