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Heterogeneous Hybrids
Information Technology in Texts and Practices

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Contents

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”The feminist in me is a fighter, a winner, a (re)vindicator, an activist, a social figure…”
(Rosi Braidotti, The Nomadic Subject, 1994, p. 153)

Background

Computers, experiences and dreams

The story starts sixteen 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 were still mere terminals; large, independent writing terminals. The latter were connected to expensive American 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 Norrland 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 throughly modern on-line library administrative system. Two years later, at Lund University, I finally got the opportunity to work with a real PC, 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 PC 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 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,

commmunication 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 Internet in particular. Those of us who were convinced as to the usefulness of 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 Blekinge, to which I later moved, the target groups of such courses varied from librarians to teachers, healthcare workers and municipal politicians. Towards the end of the 1990s, there was a great deal of discussion about working and studying on distance with a dream being independent of time and place. How should in-service distance courses work for librarians? This was what we wondered.[1]

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. 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.[2]

Questions which led from and evolved into experience

While working with computers and 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,

[1] See Appendix 1 for descriptions of courses and training programmes.
[2] Ekelin & Elovaara, 2001

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."[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 state administration in Finland.[4] 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 University of Karlskrona/Ronneby[5] created an IT and gender research department with its own chair. It was to this department 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.

Situated knowledge

This licentiate thesis addresses the meeting of my experiences, the above-outlined questions, general developments in information technology and feminist technoscientific research. It is also about how this meeting forced me both to re-formulate my old questions and ask new ones.

[3] Olsson, 1995, p. 3
[4] Göranzon, 1990; Vehviläinen, 1997
[5] The University changed name in December 2000 to Blekinge Institute of Technology

Donna Haraway describes what she calls "situated knowledge." By situated she does not mean a specified place, rather her concern is with epistemological situations.[6] Had I not been able to process my experiences in a special gender research environment I would never have been able to write this thesis. It is my experiences and the questions which grew out of the latter that constitute the beginning and point of return of my situation as it was accessed through feminist theories.

Cartography

In addition to my own experiences, I have made use of official texts about information technology while writing this thesis. I have also held discussions with librarians about their use of IT, and have used material from two EU projects. This part of my thesis belongs to the cartography section. 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 map-making is so often present in my texts . . . ."[7] 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 experiences 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. Can I avoid drawing separate maps for different information technologies in the same way as Susan Leigh Star and James R. Griesemar talk about autonomous maps which share the same boundaries but which have different contents?[8]

Diffractions

The diffraction is another 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

[6] Haraway, 2000, p. 71
[7] Braidotti, 1994, pp. 16-17
[8] Star & Griesemer, 1999, pp. 518-9

phenomenon: ”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 record 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.”[9] 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 repeating the Sacred Image of the Same.”[10]

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.[11] 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.”[12]

Boundaries

I am preoccupied with boundaries and transgressing the latter. A major reason for this preoccupation is that I have both indentified 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 post-graduate 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 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 inbetween categories and refusing to take the safest

[9] Haraway, 2000, p. 103
[10] ibid, p. 102
[11] See, for example, Bruno Latour, *We have never been modern* (Cambridge, Mass., Harvard University Press, 1993)
[12] Braidotti, 1994, pp. 13-14

route shows an understanding which is very different to the dominating kind."[13] 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 librarians 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!"[14]

Heterogeneous networks

Another kind of boundary identified is that between humans and non-humans. When it comes to information technology, non-humans are often made up of machines, other artefacts and materialities. One analytical method or a research perspective working with the concept of boundaries between humans and non-humans is "Actor-network theory" (ANT), and the later extension of this theory known as "Actor-network theory and after" (ANTA). ANT/ANTA tell technoscientific stories about heterogeneous networks. ANT/ANTA maintain that there is no need for boundaries between humans and non-humans, and that if such a boundary does exists, it is the result of a heterogeneous network. The goal is to avoid the dichotomy social/technical. The first article in this licentiate thesis discusses ANT/ANTA in general and my attempts to use these when analysing and trying to understand my empirical research material.

[13] Mörtberg, 1997, p. 11
[14] Lykke & Markussen & Olesen, 2000, p. 55

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.”[15] 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. [16] 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.

Technoscience

The term technoscience represents is in itself an transgressing of a boundary. Donna Haraway writes: ”I want to use technoscience to designate dennse 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.”[17] Technoscience is no utopia, a 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.”[18] There are many ways of participating in technoscience as a consumer, politician, parent, librarian, citizen, patient, laboratory rat, political text, nuclear weapon, headache tablet, cat, computer or a pair of glasses. Where does technoscience lead us when discussing boundaries between insiders and outsiders? If we are all on the inside in some way or another, is there, in fact, anybody on the outside? Technoscience provides scope for the librarians' stories which mix up computers, Internet, librarians, money and caretakers.

[15] Braidotti, 1994, p. 4
[16] ibid, pp. 1-4, 8, 10
[17] Haraway, 1997, p. 210
[18] ibid

Implosions

Now the introductory exercises are presented it is time to move on. My overall research question is: ”What is information technology?” 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.” But cartography is not complete. The map is still too bare. It 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.

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 praxis, 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.”[19] Braidotti’s nomads yearn for change and transformation.[20]

For what is feminist technoscience striving? 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?”[21] 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.”[22]

[19] Haraway, 1994, p. 16
[20] Braidotti, 1994, p. 22
[21] Haraway, 1994, p. 16
[22] Haraway, 1997, p. 68

Can an 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?

My work can form a contribution to the development of feminist technoscientific research. This contribution can take the form of drawing up new boundaries and/or erasing existing ones between the social and the technological both within research and education.

How does one create implosions in information technology? My research can contribute to a change in the actual concept information technology. By filling up the information technology map with day-to-day praxis it can help make information technology more down-to-earth. By using the technoscientific perspective the question of accountability is given a central position.

How do you create a link between theory and practice? How can the more theoretically orientated discussions take part in the changing process within regional and local interpretations and praxis in the field of information technology? How can one reinforce discussions about the relations between traditional knowledges, often based on experiences of skilld professionals, and present-day knowledges and their positions relative to the new forms of knowledge which information technology represents? How can discussions about relations between existing organisational forms and the new opportunities which information technology opens up be successfully developed?

These are examples of the questions which both invite to and guide continued research in the field.

Introduction to the Papers

Paper One, *Discourses and Cracks - A Case Study of Information Technology and Writing Women in a Regional Context,* is the first paper where empirical material from a local IT project is used and discussed and where it is mirrored against the dominating discourses of information technology. The first part of this paper discusses information technology 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 and reflects an optimistic belief in technology as an independent power that automatically furthers democratic development. Is it really this simple? The analysis includes a discussion of the concept of ´universal citizenship´ in a context of women's experiences in Sweden. The second part of the paper presents empirical material and experiences from the Women Writing on the Net-project (this is included in the framework of the DIALOGUE project, which was partly funded by ISPO/EU). 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 predominant IT discourses, and revealed the "cracks" in, and possibilities of feminist redefinitions of these values.

In Paper Two, *Translating and Negotiating Information Technology: Discourses and Practices,* I continue exploration of my overall research question "What is information technology?" I study the dominating discourses of information technology; these I call "the technical suit" and the "social suit." In my empirical field studies among librarians in southeast Sweden I explore how the two faces of information technology - the technical and the social - are translated into librarians´ work practices. I study a project which was defined by the librarians themselves as an information technology project. I investigate how this project complies with the social/societal definitions of information technology, and how it complies with the technical definitions of information technology. In my second empirical study, I use two case studies with librarians involved in constructing web sites on the Internet. The Internet and the web are often seen in part as an open and undefined landscape in which new actors can move freely and build new partnerships, and partly as a shadow landscape of existing structures and relationships which can close up new openings. In the concluding discussion, I state that 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 into 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 suggest that information technology is impure. It is a hybrid. Inspired by Donna Haraways´s technoscientific metaphor of cyborg I claim that information technology is a cyborg in itself.

In the third paper, *From Networks to Fluids and Fires – A Prelude to Actor-Network Theory,* I discuss a method of analysis I have tried to apply to my empirical material. I explore the notions of Actor-Network Theory (ANT), and Actor-Network Theory and After (ANTA). My point of departure is the way some official texts in Sweden define the concept of information technology by stressing the technical aspects of IT; at the same time they present information technology as a motor and a driving force for many sectors of society. In my research, I have discussed with librarians how they shape and transform information technology in their own work practices. The problems of analysing this empirical material started when the librarians started to talk about people, machines and money all in one breath. How could one understand their way of talking about information technology where the two separate lines of information technology identified in the official texts did not seem to be identified as pure and separable phenomena? How was it possible to understand the concept of information technology as it was used by the librarians, who seemed to involve all kinds of different heterogeneous elements which at first sight were very far away from information technology? It was when asking these questions that I discovered ANT and ANTA. In this paper, I present some basic ideas about these two research approaches by reading and analysing articles published between 1980 and the year 2000. In addition to the ANT and ANTA perspectives, I also introduce my own research questions: story telling and epistemological problematisations closely connected with feminist theories are, for example, closely intertwined in this paper.

Literature

Braidotti, Rosi (1994) — Nomadic Subjects: Embodiment and Sexual Difference in Contemporary Feminist Theory. New York, Columbia University Press

Ekelin, Annelie & Elovaara, Pirjo (2001) — Discourses and Cracks : A Case Study of Information Technology and Writing Women in a Regional Context. Karlskrona**,** Blekinge Institute of Technology. Licentiate Thesis, pp.16-36

A shorter version published in Balka, Ellen & Smith, Richard (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. Boston & Dordrecht & London, 2000, Kluwer Academic Publishers, pp. 199-207

Göranzon, Bo (1990) — Det praktiska intellektet : datoranvändning och yrkeskunnande. [The Practical Intellect: Computers and Skill]. Stockholm, Carlsson. Akademisk avhandling [Academic Dissertation]

Haraway, Donna (1994) — A Game of Cat´s Cradle : Science Studies, Feminist Theory, Cultural Studies in *Configurations* 1, pp. 59-71

Haraway, Donna (1997) — Mice into Wormholes : A Comment on the Nature of No Nature in Downey, Gary Lee & Dumit, Joseph (eds.): *Cyborgs* & Citadels : Anthropological Interventions in Emerging Sciences and Technologies. Santa Fe, School of American Research Press, pp. 209-243

Haraway, Donna (2000) — How Like a Leaf. An Interview with Thyrza Nichols Goodeve. New York & London, Routledge

Latour, Bruno (1993) — We Have Never Been Modern. Cambridge, Mass., Harvard University Press

Lykke, Nina & Markussen, Randi & Olesen, Finn (2000) "There are always more things going on than you thought!" : Methodologies as Thinking Technologies in *Kvinder*, Køn & Forskning 4, pp. 52-60

Mörtberg, Christina (1997) ”Det beror på att man är kvinna…” : Gränsvandrerskor formas och formar informationsteknologi. [”It´s Because One is a Woman…”: Transgressors Are Shaped and Shape Information Technology]. Luleå, Institutionen för arbetsvetenskap, Avdelningen Genus och teknik. Akademisk avhandling [Academic Dissertation]

Olsson, Lena (1995) Det datoriserade biblioteket : maskindrömmar på 70-talet. [The Computerized Library : Machine Dreams of the 70s]. Linköping, Linköpings universitet. Akademisk avhandling [Academic Dissertation]

Star, Susan Leigh (1999) & Griesemer, James R. Institutional Ecology, ”Translation,” and Boundary Objects; Amteurs and Professionals in Berkeley´s Museum of Vertebrate Zoology, 1907-39 in Biagioli, Mario (ed): The *Science* Studies Reader. New York & London, Routledge, pp. 505-524. [The article was originally published in 1989]

Vehviläinen, Marja (1997) Gender, Expertise and Information Technology. Tampere, Department of Computer Science, University of Tampere. Academic Dissertation

Paper 1

[A shorter version of this article is published in “Women, Work and Computerization : Charting a Course to the Future”. IFIP TC WG 9.1 Seventh International Conference on Women, Work and Computerization, June 8-11, 2000, Vancouver, British Columbia, Canada. Boston & Dordrecht & London, Kluwer Academic Publishers, 2000, pp. 199-207]

Discourses and Cracks – A Case Study of Information Technology and Writing Women in a Regional Context

by Annelie Ekelin & Pirjo Elovaara

Introduction

In the Finnish story known as ”Granen” - The Christmas Tree - by Tove Jansson 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 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".[1] 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".[2] 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".[3] The dominant discourse as Mörtberg defines it is not hermetically sealed, however. There are always "cracks, or inadequacies".[4] Wherever there is power, there is counter power.[5] 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

[1] Johansson & Nissen & Sturesson, 1998, p. 39
[2] Mörtberg a, 1997, p. 38
[3] Göranzon,1990, p. 134
[4] Fahlgren,1998, p. 25
[5] Järvinen, 1998, p. 52

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.[6]

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".[7] 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

[6] Cerf, 1999
[7] Hur ska vi i Blekinge använda IT?, 1996

(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!"[8] 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.

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.[9] 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".[10]

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

[8] Ingemarsson
[9] Ronneby kommun(b), (c)
[10] Ronneby kommun (b), (c)

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.[11] 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"[12], 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",[13] 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".[14]

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".[15] Characteristic of the belief in autonomous technological development is that it automatically furthers democratic development. IT is thus

[11] Persson, 1999
[12] Bildt, 1998
[13] Andersson & Daléus
[14] Johansson & Nissen & Sturesson, 1998, pp.43-44
[15] Mörtberg, b, 1997, p. 25

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).[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.[17] Ruth Lister writes as follows about universal democracy: ” a concept, originally predicated on the very exclusion of women”.[18] 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.[19] The definition and application of democracy is based on a dichotomy or dualism between the public and the private.[20] 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.[21] 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

[16] Marshall, in Voet, 1993, pp. 15-16
[17] Kahlert, 1997, p. 26
[18] Lister, 1997, p. 195
[19] ibid, p. 204
[20] ibid, p. 198
[21] ibid

electronic and digital democracy (SOU 1999:12, Electronic Democracy). 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[22]
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"[23]
Model 3: well thought-out reform: "a reform from above i.e. high-level political decisions"[24]

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".[25] The real issue becomes instead, "how do we get those citizens who are not interested in politics to become active and participate"?[26] 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".[27]

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"?

[22] Olsson, 199, pp. 55-56
[23] ibid, pp. 62-63
[24] ibid, p 65
[25] ibid, p. 103
[26] ibid, p. 39
[27] ibid, p. 26

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”.[28] 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”.[29]

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.[30] 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”.[31] 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

[28] Andersson & Rosenqvist,1998, p. 40
[29] ibid, p. 42
[30] Ronneby kommun (a)
[31] Olsson, 199, p. 127

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 (discourse analysis) 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).[32] 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,

[32] Dialogue

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".[33] 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.

[33] Alcoff, 1988, p. 424

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".[34] 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.[35] 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 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.[36] 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-

[34] Papert, 1994, p. 78
[35] ibid, p. 124
[36] ibid

known materials can be said to be practicing bricolage. They tend to try one thing, step back, reconsider, and try another".[37]

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.[38] 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,[39] 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.[40]

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.

[37] Turkle,1997, p. 51
[38] Kahlert, 1997, p. 19
[39] Olsson, 1999, pp. 62-63
[40] See, for example, MeKay, 1998, p. 187

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.[41] 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.[42] 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

[41] Woolf, 1958, p. 11
[42] Star, 1996, pp. 31-34

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. …

CURTAIN

Literature

Alcoff, Linda (1988)	Cultural Feminism versus poststructuralism: the identity crisis in feminist theory. In *Signs* 13, 3, pp. 405 - 436.
Andersson, Birgitta & (1998) Rosenqvist, Ann-Marie	Kvinnobilder av Blekinge: en rapport från projektet Kvinnors visioner om det framtida Blekinge. [Women´s Pictures of Blekinge: a Report from the Project "Women's Visions of the Future Blekinge"]. Lund, Lund University
Andersson, Elving & Daléus,Lennart (1999)	Låt inte IT-användningen bli en klassfråga" [Don't Let the Use of IT Become a Question of Class], www.centerpartiet.se/
Bildt, Carl (1998)	Carl Bildt veckobrev v. 11/1998 [Carl Bildt's Weekly Letter 11/1998], www.moderat.se/index.asp?main=ideer asikter/index.asp
Cerf, Vinton (1999)	The Internet is for Everyone, www.isoc.org/isoc/media/speeches/foreveryone.shtml
Dialogue	Dialogue, www.ronneby.se/dialogue/ www.ronneby.se/dialogue/storybook/default.htm www.connected.org/methods/intro.html
Fahlgren, Siv (1998)	Diskursanalys, kunskap och kön: ett försök att utveckla en teoretisk ram och ett arbetssätt för en diskursanalys av vetenskapliga texter [Discourse Analysis, Knowledge and Gender: an Attempt to Develop a Theoretical Framework and Working Method for a Discourse Analysis of Scientific Texts] Umeå, Umeå Universitet, Institutionen för socialt arbete, nr 23, 1998
Göranzon, Bo (1990)	Det praktiska intellektet: datoranvändning och yrkeskunnande [The Practical Intellect: Computers and Skills].Stockholm, Carlsson
Hur (1996)	Hur ska vi i Blekinge använda IT? [How Should Blekinge Use IT?]. Karlskrona, IT-Blekinge

Ingemarsson, Svante	Pilotregion (Pilot Region), www.itblekinge.se
Jansson, Tove (1986)	Det osynliga barnet och andra berättelser [The Invisible Child and Other Stories]. Stockholm, Bonniers
Johansson, Magnus & (1998) Nissen, Jörgen & Sturesson, Lennart	IT-ism: informationstekniken som vision och verklighet [ITism: Information Technology as Vision and Reality]. Stockholm, KFB (Via Teldok 32, KFB-rapport 11)
Järvinen, Margaretha (1996)	Makt eller vanmakt? [Power and Powerlessness?]. In *Kvinnovetenskaplig* tidskrift 1, pp. 47 - 62
Kahlert, Heike (1997)	Feminist Perspectives on Democratization. In Women, work and computerization: Spinning a Web from Past to Future. In *Proceedings* of the 6th international IFIP conference, Bonn, Germany, May 24 - 17, 1997. Berlin, Springer, pp. 17 - 29
Lister, Ruth (1997)	Citizenship: Feminist Perspectives. Basingstoke, Macmillan
McKay, Anne (1988)	Speaking up: Voice Amplification and Women's Struggle for Public Expression. In *Technology* and Women's Voices: Keeping in Touch. Ed. by Chris Kramarae. New York, Routledge & Kegan Paul, pp. 187-206
Mörtberg, Christina (a) (1997)	Det beror på att man är kvinna… : gränsvandrerskor formas och formar informationsteknologi [It´s Because One is a Woman : Transgressors are Shaped and Shape Information Technology]. Luleå, Luleå University. Academic Dissertation
Mörtberg, Christina (b) (1997)	IT politik - mot feministiska alternativ? [IT Politics - Towards Feminist Alternatives?]. In *Kvinneforskning* 2, pp. 25-36

Olsson, Anders R. (1999)	Elektronisk demokrati [Electronic Democracy] Demokratiutredningens skrifter nr 16 (Statens offentliga utredningar 1999:12). Stockholm
Papert, Seymour (1994)	Hur gör giraffen när den sover [The Children's Machine]. Göteborg, Daidalos
Persson, Göran (1999)	Öppnandet av Riksmötet]The Opening of the Session] 1999-09-14. Regeringsförklaring av Göran Persson, www.riksdagen.se/debatt/9900/prot/2/htframe.htm
Ronneby kommun (a)	www.ronneby.se
Ronneby kommun (b)	Paraplyprojekt 2003 (The Municipality of Ronneby. Umbrella Project 2003), www.ronneby.se/ronneby(infoc/projekt/2003proj.html
Ronneby kommun (c)	IT i Ronneby (IT in Ronneby), Nyhetsbrev (Newsletter), www.ronneby.se/ronneby/infoc/projektnyhetsvrev/lista.html
Star, Susan Leigh (1996)	From Hestia to Home Page: Feminism and the Concept of Home in Cyberspace. In *Between* Monsters, Goddesses and Cyborgs: Feminist Confrontations with Science, Medicine and Cyberspace. Ed. by Nina Lykke & Rosi Braidotti. London, Zed Books, pp. 30-46
Turkle, Sherry (1997)	Leva.online [Life on the Screen]. Stockholm, Norstedt
Voet, Rian (1993)	Women as Citizens and the Role of Information Technology. In *Computers* and Society. Ed. by Colin Beardon & Diane Whitehouse. Oxford, Intellect , pp. 15 - 26
Woolf, Virginia (1958)	Ett eget rum och andra essäer [A room of One's Own and Other Essays]. Stockholm, Tiden

Paper 2

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Translating and Negotiating Information Technology : Discourses and Practices

"In the leading Nordic IT state the most prominent spring song is not that of the sun-worshippers but of those forced to replace their PC screens as a result of disturbing sunbeams." [1]

I do not know about you but I am confused. Information technology - IT - seems to be everywhere. You cannot read your morning paper without seeing the two magical letters 'IT'. On television you find such programs as "IT for teachers" and "Sajber"[2]. At the beginning of March 2000 one could read in 'Dagens Nyheter' (the largest morning paper in Sweden) that "Sweden is among those rich countries which invests most in the new information technology. In Europe, Sweden is the leading IT nation and globally only the USA is stronger."[3] I am working at a university which claims to have an IT profile. In the local newspapers you can read articles about IT-related crimes, local IT developments and IT issues in general. These are signs that the very concept of IT in its various guises is considered as a factor that strengthens and intensifies the building of society in the future. As a reader you are both supposed to understand the phenomena of IT and to identify and agree with the picture painted: IT is a crucial element in the future development of the whole country in all areas and at all levels of practice. Does the following remark sound familiar? "The actor tells you what you want, what you will be able to do in 5, 10 or 15 years, in which order you will do it, what you will be glad to possess, and of what you will be capable. And you really believe this, you identify with the actor and help him or her with all your strength…"[4]

Has information technology become a black box today? A box that "contains that which no longer needs to be considered".[5] Or perhaps instead we 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 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" [6] They continue: "The sociologists – teratologists – are in warm, light places, the

[1] Journalist Ludvig Rasmusson, Swedish Radio P1, 12th March 2000, freely interpreted by Pirjo Elovaara
[2] A TV-program directed for young people. The title "Sajber" can perhaps be understood as a way to familiarise the original English term ´cyber´
[3] TT-nyhetsbanken 3rd March 2000
[4] Callon & Latour, 1981, p. 288
[5] ibid, p. 285
[6] ibid, p. 286

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." [7] 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. And 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 define who is allowed to act and who is not. When talking about information technology it is very easy to be both pessimistic and sceptical. If you only see the actors, usually defined as macro-actors, such as Ericsson, Nokia, the state, commerce etc., we reinforce boundaries and closed systems. By expanding and defining/redefining the structures, frames, rules and actors, new openings are also created for feminist 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."[8]

As a point of departure in the following text, I try to peep into the black box of information technology. I do it in an attempt to decrease the feeling of confusion described at the beginning of this paper. My aim is to discover if there is an answer to the question 'what is information technology?'

The first step in my investigation is to explore the technical discourse i.e. the technical 'suit' of information technology. Then I go on to explore to what extent information technology can be regarded as a political and an ideological discourse primarily formulated in different kinds of official texts. Put another way, I will examine the social/societal 'suit' of information technology.

In my own empirical field studies among librarians in southeastern Sweden I explore how the two faces of information technology - the technical and the social - are translated into work practices. I have looked at a project which has been defined by the librarians themselves as an information technology project. I study how this project meets the social/societal definitions of information technology and how it meets the technological definitions of information technology

In my second empirical study, I use two case studies of librarians constructing web sites on the Internet. Internet and the web are often seen partly as an open and undefined landscape where new actors can move freely around and build new

[7] Callon & Latour, 1981, p. 301
[8] Star, 1991, p. 83

partnerships, and partly as a shadow landscape of existing structures and relationships which can close new openings.

In my own research, the expansive approach has resulted in the use of geography as a place of seeing. 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.' [9] 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.

Information technology as a technical discourse

Information technology is often considered to be a technical project. One could also say that the focus is often put on the technical aspects of information technology. In 1994 the terms 'computerisation' and 'automation' were replaced by 'information technology' thanks to the Internet and its expansion[10]. The technical perspective is very pronounced when one looks at the different definitions of the term 'information technology' or 'IT.' I should like to cite just one example, in the form of a Swedish government bill from 1995/96: "IT is a generic term for different kinds of techniques which can be used to create, store, process, transmit

[9] I find the notion of situated knowledges inspiring. For further reading, see Haraway (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.
[10] I searched the Swedish article data base A-sök on 15th February 2000 and found when using the search phrase ´informationsteknik´ that the number of articles increased between 1993 and 1994 from 22 to 136

and present sound, text and image. IT makes these activities and processes possible, independent of the amount of information and geographical distances." [11] So the official state definition really sees information technology as technology as well as technical implementations.

We also talk about IT professions, but to whom are we actually referring? Programmers, system developers, system designers, network technicians, technical support people in the main. The same definition of IT profession can also be found in the latest Swedish government bill "Information society for everybody". In one of the appendixes the following description of IT courses can be found: "… computer technology/computer science, electronics/electrotechnics, system development-/informatics, technical physics and other IT educational programs".[12]

We also use the term 'IT industry' when referring to companies working with telecom solutions, software production and infrastructure solutions, as well as broadband (high capacity data network) in Sweden. In the same government bill, in the list of IT educational programs, we also find a summary of the complete bill: "The IT political goal is that Sweden as the first nation will be an information society for everyone. In an action programme which includes suggested measures, a demonstration will be given of IT work in the future. Tax relief is proposed in order to stimulate connection with the broadband network. Governmental support can also be used in regional computer network and when extending the broadband network to sparsely populated areas. A total of 5.8 billion Swedish crowns [approximately 6.7 million USD] will be reserved for this purpose. In addition, Svenska kraftnät (a Swedish broadband company) will build up a backbone based on investigations of conditions adjusted to market needs. In order to reach all municipalities in Sweden an estimated 2.5 billion Swedish crowns [approximately 2.9 million USD] is required." [13] The emphasis is on development of the infrastructure. Private IT companies have been designated a central role in this process.

Information technology is also to a considerable degree about technical artefacts: computers, modems, scanners, digital cameras, printers, software. A useful illusration is computers and the way in which they are described in the government bill referred to earlier in this chapter. The bill introduces the notion of 'IT maturity,' which can be measured both by accessibility as well as the use of computers and the Internet. [14]

[11] Regeringens proposition 1995/96:125
[12] Regeringens proposition 1999/2000:86
[13] Regeringskansliet, faktablad 29 mars 2000
[14] Regeringens proposition 1999/2000:86

Information technology as a social discourse

In this chapter I have chosen to look at some texts and statements about information technology produced by one particular municipal authority, one semi-governmental organisation and three of the political parties represented in the Swedish parliament.

What do these texts say about information technology?

First, let us read some texts produced by one of the five municipalities in the county of Blekinge. 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 municipality 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 spearhead projects are being developed alongside major investments. Ronneby is a test bench for full-scale IT investments."[15] The goal of the 2003 project is, among other things, to make IT a democratic right, to bring into being an information society, and to entice new companies to the area.

To continue our reading: "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".[16]

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".[17] 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

[15] Ronneby kommun a, b
[16] ibid
[17] Hur ska vi i Blekinge använda IT?

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!" [18] 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 would want to miss the trip?

A common thread in the above-quoted texts is the view that "IT is for everyone". This is the self-evident official motto 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 when opening the parliamentary session in September 1999.[19] 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"[20], says Carl Bildt, ex-party leader 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",[21] was the comment of Centre Party politicians Lennart Daléus and Elving Andersson at the Centre Party congress in 1999.

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

[18] Ingemarsson
[19] Persson, 1999
[20] Bildt, 1998
[21] Andersson & Daléus

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”.[22]

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”. [23] 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”.[24]

Can we find parallel groups outside the public sector whose aim is to show where Swedish society is going, or where it should go in order to gain from the growing use of and attachment to information technology. Let us look at one particular case, that of Jonas Birgersson. He is 28 years old and director of an IT consultancy company “Framfab” (an acronym for the Swedish word Framtidsfabriken; in English, Factory of the Future), valued on the stock exchange at about 30 billion Swedish crowns [approximately 3.5 billion USD]. I have chosen three articles in which Birgersson is the key person. The first of these articles was published in February 2000 in the magazine “Computer Sweden” [25] and was entitled “15 persons who have control over the new economy”. According to this article he has “the ambition to become one of the leading Internet consultants in the whole world”. [26] But what really makes him a very important person is that “he's got the ear of the prime minister, the financial world listens to him, he can mingle with the real great ones during the top meeting in Davos and he (still) is the golden boy of the media”. And the story goes on: “But it is not the business man Jonas Birgersson who is the strong one. Instead it is the visionary, commander and lobbyist Jonas Birgesson that is really important. “…He has already kicked Swedish politicians, debaters and managers one or two

[22] Johansson & Nissen & Sturesson, 1998, pp. 43-44
[23] Mörtbeg, 1997, p.25
[24] Ekelin & Elovaara, 2001
[25] Computer Sweden, 25th February 2000
[26] ibid

internetyears forward."[27] In another paper he is asked the question "What are you going to do to make Sweden better than it is today?" He answers: "We do it by creating new conditions for business in Sweden. A new infrastructure and a new education create advances in concurrence situations so that the companies can make more money in order to distribute it in the welfare state. Then we can afford schools and care."[28] The title of this article was "Birgersson believes that there is a future for Gothenburg"[29]

Now I have identified some of the elements of information technology: texts, statements, municipalities, semi-governmental bodies, political parties, people, computers, software. I have also claimed that information technology is both a social and a technical issue. The next step is to see how information technology is shaped in practices, and what kind of IT we gain when it is regarded as common praxis.

"A way to travel…"

I ran into problems with the empirical material I wished to use when talking about information technology as doing and as practice. The discussions, documents and stories were just a disorganised chaos. How should they be analysed and how could I make sense of them? In other words, where could I find a map, a compass and binoculars with which to move around in the information technology landscape without getting lost?

It was as I was asking these questions that I stumbled on the actor network-theory. [Just as a sign of distance, both geographical and intellectual, I must confess that before the autumn 1999 ANT would not have meant anything to me…]. But now I know more, and I am aware that talking about actor-network theory is like jumping into a cold tub. "The naming and easy transportability of the ´ANT´ surely also sets alarm bells ringing." or "…the little descriptive accolades – or for that matter equally quick rubbishings…."[30].

What I did find was an article by Michel Callon from 1986. [31] In this article he describes the development of an electrical car (VEL) in France in the 1970s. He identifies how the engineers employed by the Electricité de France (EDF) initiated the development project which had as its goal to create a new type of vehicle which did not use fossil fuel as a source of energy but electricity. What struck me in this

[27] Computer Sweden, 25th of January 2000
[28] Borås newspaper, 10th March 2000
[29] ibid
[30] Law,1999, p.2
[31] Callon, Michel (1986): The sociology of an Actor-Network: The Case of the Electric Vehicle in The Mapping the Dynamics of Science and Technology: Sociology of Science in the Real World. Edited by Michel Callon, John Law and Arie Rip. Houndmills and London, Macmillan

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. And what are also unveiled are the movements inside and outside the project as well as the interactions that keep the project together as well as the separate actors and actions.

I want to stress explicitly that in this paper I use the actor-network theory solely as a tool for analysis, a sort of wide-angle lens, or as Bruno Latour expresses it: "…it [=ANT] is also…simply a way for the social scientist to access sites, a method and not a theory, a way to travel from one spot to the next, from one field site to the next…."[32]

The aspects of the actor-network theory I found particularly useful were the concepts of 'actor' and 'translation' and, of course, the way in which the actor-network works with relations, in other words, networks. By using the concept 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."[33] 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?'[34] Could I find the points of obligatory passage that translations determine: applications, reports, goal descriptions?[35] The concepts of 'actor' and 'translation' were a 'seeing' device by which I could give a focus to my empirical material. The 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

[32] Latour, 1999, p. 20
[33] Callon & Latour, 1981, p. 286
[34] Callon, 1986, p. 24
[35] ibid, pp. 26-27

information technology but something shaped in many ways depending on who the actors are and the interactions between them.

The actor-network perspective goes beyond ready-made categories, and in so doing it becomes possible to capture something unexpected and surprising. Going beyond categories includes actors as well as activities. So, for example, we do not have decision makers, or rather we must decide that we look for decision-makers, planners and users as well as the corresponding decision making, planning or usage. One reason for avoiding predetermined categories is that our understanding of them and the categories in themselves are based on earlier activities. By focusing on these we strengthen the previous hierarchies and power positions. As I understand it, actor-network thinking also offers me a way of side stepping power constructions and localising areas of resistance.

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.

'Doing' number 1: 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.[36] 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.

[36] 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.

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."[37]

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 impaired etc. The IT studios also have extensive videoconference equipment for ISDN communication."[38].

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."[39] 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.

[37] The Bruk Project
[38] ibid
[39] ibid

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[40]. 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[41]… 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[42]…"[43]

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…" [44]

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 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

[40] 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/

[41] Lundaforum is a Swedish brand experience company, http://www.lundaforum.se/

[42] 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

[43] The Bruk Project

[44] Discussion with one of the participating librarians on 24th February 2000

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´[45]. 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][46] she wrote that she never before had met "people with greater passion, who are more altruistic and more dedicated"[47] 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".[48] 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."[49]

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

[45] see description of the word ´folkbibldning´ on page 53
[46] Palmgren, 1909
[47] ibid, p. 160
[48] ibid
[49] Discussion with one of the participating librarians on 24th February 2000

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."[50] 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."[51]

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."[52] 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."[53] 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…"[54]

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

[50] Discussion with the project leader on 23rd February 2000
[51] Discussion with one of the participating librarians on 24th February 2000
[52] ibid
[53] ibid
[54] ibid

project as a ´folkbildningsprojekt'[55]."[56] 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…[57]

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 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.[58]

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

[55] 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

[56] Discussion with one of the participating librarians on 24th February 2000

[57] The House that Jack Built, a children´s poem of contacts, interactions and networks, see, for example, http://www.michaelmade.com/html/jack.html

[58] The Bruk Project

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.

The 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 ´bough´ 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 dis-semination 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.

Doing number 2: 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."[59] 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 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…"[60]

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

[59] The original project application is dated 19th November 1999
[60] Discussion with Anna on 18th February 2000

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…"[61]

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. Behind the Internet project lies a new organisation of the school system. The head of 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 …"

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."

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

[61] Discussion with Anna on 18th February 2000

when creating the pages. We have different perspectives. So the possibilities are here and there…"[62]

It is fascinating to follow different ways of creating web pages. We see a mixture of human and non-human actors[63]. 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 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."[64] 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. [65]

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

[62] Discussion with Eva on 6th March 2000
[63] See, for example, Callon, 1991, pp. 140-142
[64] Star & Strauss, 1999, p. 10
[65] ibid

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"[66] carried out primarily by embodied human beings.

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´[67]. 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."[68] What is more important than seeing science and technology as

[66] Star & Strauss, 1999, p. 15
[67] Latour, 1999, pp. 174-175
[68] Haraway, 1997, p. 3

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.[69] 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."[70]

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',[71] 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'. And 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. And perhaps without being conscious of this at an analytical or theoretical level, they are the hybrids. And 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 that 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.

In this text I have discussed information technology as a social discourse and/or as a technical discourse. 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. And by saying this, I am also aware that there are 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.

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[69] See, for example, Landström (1998) and Mörtberg (1999)
[70] Haraway, 1997, p. 14
[71] Callon, 1990, p. 83

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.

Literature

Andersson, Elving & Daléus, Lennart	Låt inte IT-användningen bli en klassfråga" [Don't Let the Use IT Become a Question of Class], www.centerpartiet.se/
Bildt, Carl (1998)	Bildt veckobrev v. 11/1998 [Carl Bildt's Weekly Letter11/1998], www.moderat.se/index.asp?main=ideer asikter/index.asp
Borås (2000)	Borås tidning [newspaper], 10th March 2000, www.mediearkivet.se
Bruk	The Bruk Project, www.ltblekinge.se/kultur/lansbibl/index.htm
Callon, Michel (1986)	The Sociology of an Actor-network: the Case of the Electric Vehicle in *Mapping* the Dynamics of Science and Technology: Sociology of Science in the Real World. Edited by Michel Callon, John Law and Arie Rip. Houndmills and London, Macmillan, pp.18-34
Callon, Michel (1990)	Society in the making: the study of technology as a tool for sociological analysis in *The social* construction of technological systems: new directions in the sociology and history of technology. Ed by Wiebe E.Bijker, Thomas P. Hughes and Trevor Pinch. Cambridge, Massachusetts & London, England, The MIT press, 3.pr., pp. 83-103
Callon, Michel (1991)	Techno-Economic Networks and Irreversibility in *A Sociology* of Monsters : Essays on Power, Technology and Domination. Edited by John Law. London & New York, Routledge, pp. 132-161
Callon, Michel & Latour**,** Bruno (1981)	Unscrewing the Big Leviathan; How Macro-Actors Macro-Structure Reality and How Sociologists Help Them to Do So In *Advances* in Social Theory and Methodology: Toward an Integration of Micro- and Macro-Sociologies. Edited. by K. Knorr-Cetina and A.V. Cicourel Boston, London and Henley, Routledge & Keegan Paul, pp. 277-303

Computer (2000)	Computer Sweden [computer magazine] Sweden, 25th February 2000, www.ad.se
Ekelin, Annelie & (2001) Elovaara, Pirjo	Discourses and Cracks : A Case Study of Information Technology and Writing Women in a Regional Context. Karlskrona**,** Blekinge Institute of Technology. Licentiate dissertation, pp.16-36 A shorter version published in Balka, Ellen & Smith, Richard (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. Boston & Dordrecht & London, 2000, Kluwer Academic Publishers, pp. 199-207
Haraway , Donna (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.
Haraway, Donna (1997)	Modest_Witness@Second_Millenium. FemaleMan©_Meets_OncoMouse™ : Feminism and Technoscience. New York & London, Routledge
Hur (1996)	Hur ska vi i Blekinge använda IT? (1996) [How Should Blekinge Use IT?]. Karlskrona
Ingemarsson, Svante	Pilotregion [Pilot Region], www.itblekinge.se/
Johansson, Magnus(1998) & Nissen, Jörgen & Sturesson, Lennart	IT-ism: informationstekniken som vision och verklighet [ITism: Information Technology as Vision and Reality]. Via Teldok 32, KFB-rapport 1998:11, Stockholm
Landström**,** Catharina (1998)	Everyday Actor-Network: Stories about Local and Global in Molecular Biology. Göteborg, Göteborg University, Department of Theory of Science and Research. [Academic Dissertation]

Latour, Bruno (1999)	On Recalling ANT in *Actor* Network Theory and After. Edited by John Law and John Hassard. Oxford, Blackwells Publishers/The Sociological Review, pp. 15-25
Law, John (1999)	After ANT: Complexity, Naming and Topology. In *Actor* Network Theory and After. Edited by John Law and John Hassard. Oxford, Blackwells Publishers/The Sociological Review, pp. 1-14
Mörtberg, Christina (1997) (a)	IT politik - mot feministiska alternativ? [IT Politics – Towards Feminist Alternatives?]. In *Kvinneforskning* 2, pp. 25 – 36
Mörtberg, Christina (1999) (b)	Technoscientific Challenges in Feminism in *Nora* no. 1, vol. 7, pp. 47-62
Orr, Julian (1996)	Talking about Machines. IRL Press
Palmgren, Valfrid (1909)	Bibliotek och folkuppfostran : anteckningar från en studieresa i Amerikas Förenta Stater [Libraries and Awerness Building : A Study Tour to the United States of America]. Stockholm, 1909
Persson, Göran (1999)	Öppnandet av Riksmötet [The Opening of the Session] 1999-09-14. Regeringsförklaring av Göran Persson, www.riksdagen.se/debatt/9900/prot/2/htframe.htm
Regeringens (1995/96)	Regeringens proposition 1995/96:125, Åtgärder för att bredda och utveckla användningen av informationsteknik [Government Bill 1995/96:125, Measures to broaden and develop the use of information technology], rixlex.riksdagen.se
Regeringens (1999/2000)	Regeringens proposition 1999/2000:86 Ett informatiossamhälle för alla, Bilaga 13 Statistik [Government Bill 1999/2000:86, Information Society for all, Appendix 13 Statistics], naring.regeringen.se/propositioner_mm/propositioner/pdf/it/bil13.pdf

Regeringskansliet (2000) — Faktablad (short facts), Näringsdepartementet 29 mars 2000 " Regeringens förslag i proposition 1999/2000:86 Ett informationssamhälle för alla " [the Swedish Cabinet Office and the Ministries, Information Sheet, Ministry of Industry, Employment and Communication 29th March 2000

Ronneby kommun (a) — Paraplyprojekt 2003 [The Municipality of Ronneby. Umbrella Project 2003], www.ronneby.se/ronneby(infoc/projekt/2003proj.html

Ronneby kommun (b) — IT i Ronneby [IT in Ronneby], Nyhetsbrev (Newsletter), www.ronneby.se/ronneby/infoc/projektnyhetsvrev/lista.html

Star, Susan Leigh (1991) — Invisible Work and Silenced Dialogues in Knowledge Representation. In *Women,* Work and Computerization: Understanding and Overcoming Bias in Work And Education. Proceedings of the IFIP TC9/WG 9.1 Conference on Women, Work and Computerization. Helsinki, Finland. 30 June – 2 July 1991. Ed by Inger V. Eriksson and Barbara A. Kitschenham and Kea G. Tijdens. Elsevier, pp.81-87

Star**,** Susan Leigh Strauss, Anselm (1999) — Layers of Silence, Arenas of Voice: the Ecology of Visible and Invisible Work in *Computer* Supported Cooperative Work 8, pp. 9-30

TT-nyhetsbanken (2000) — TT-nyhetesbanken [The News Agency TT], 3rd March 2000, www.ad.se

Woolgar, Steve (1991) — Configuring the User: The Case of Usability Trials in *A Sociology* of Monsters : Essays on Power, Technology and Domination. Edited by John Law. London & New York, Routledge, pp. 57-99

Paper 3

From Networks to Fluids and Fires - a Prelude to Actor-Network Theory

Introduction

This article is a crossroad where several roads and paths meet. The roads and paths are made up primarily of questions connected with my overall research question: "What is information technology?" I have previously investigated two recent Swedish government bills[1] to see how the official texts define the term 'information technology'. I have investigated how official formulations are moved and transformed into local practices by librarians employed at public libraries.

The results of the first investigation, where I worked with texts, showed that official definitions were strongly focused on the technical aspects of information technology. The definitions referred to "different techniques to be used to create, store, process, transfer and present sound, text and images."[2] These definitions were not radically reformulated in the new government bill from 1999/2000: "IT can be said to be a large technical system for information processing and communication in its broad definition. IT is based on a fusion of different techniques and older infrastuctures, such as computers and telesystems, and television and other media techniques."[3] However, on closer study of the later bill other words started to emerge: employment, democracy, equity, and ecological balance. Such words point to a society where everything is interrelated by means of the same information technology which, a few pages earlier, had been presented as a purely technical phenomenon. The first confusion started to emerge. Is information technology one single thing, can it be two different things, an either-or-phenomenon or two different things simultaneously, a both-and-phenomenon?

The second investigation - movements and transformations of information technology to practices - resulted in collecting data by interviewing librarians. I chose three librarians who were actively involved in developing and taking part in various information technology activities. One of them was involved in a regional IT project owned and co-ordinated by the public libraries and the university library of the region where my research was geographically located. Two of the librarians were school librarians developing web pages and web-based library services for their own institutes. In addition to discussing with the three librarians, data was also collected from written documents e.g., project applications. The librarians talked about

[1] Elovaara, 2001
[2] Regeringens proposition 1995/1996:125, Åtgärder för att bredda och utveckla användningen av informationsteknik
[3] Regeringens proposition 1999/2000:86, Ett informationssamhälle för alla

computers, data cables, computer mice, university students, Microsoft Office software, training courses, video conferences, co-operation, books, senior citizens, colleagues, resistance, and libraries. The project documents addressed the issues of money, steering group, purchase policy, time, and statements of account. And here the second confusion started to emerge. How should one understand information technology when the librarians and the documents were simultaneously talking about people, machines, and money?

At the same time, I was working with images presenting information technology. In one of these there was a group of librarians sitting around a table. The picture, dating from the 1950s, relates the history and traditions of libraries and librarians. Among the important details portrayed are books and people, and the bringing together of these. The second image shows a young librarian standing in front of a personal computer. The important detail in this picture is the interaction taking place between the librarian, the computer and the people present by means of artefacts. The third image shows a man working with a computer and a mobile phone. He is sitting at an airport, waiting for a plane. It is important to note the interaction between the man, the artefacts and the people present by means of artefacts. The last image shows an old woman writing on her personal computer. What is significant in this picture is the interaction between the woman, the computer and the people present by means of artefacts.

All the images participated, like an invisible choir, in my empirical material. There were people, machines, interactions, places, memories and experiences. The question which arose was: 'how should one take care of all the different elements and bring them together into one analysis and one story? 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 librarians, in the documents and texts, and images describing information technology?

Other roads leading to the crossroad are ´actor-network theory´ (hereafter referred to as ANT) and ´actor-network theory and after´ (henceforth referred to as ANTA). In the autumn 1999 I happened to read an article by the French sociologist Michel Callon. The article 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 elements participate actively in the story, hesitate, act out given roles, and resist. The story is tempting and inspiring. Wasn´t Callon, in fact, doing something I had only dreamt about? Was he not telling one, multilayered story? Had Callon and other ANT/ANTA writers not provided the very method of analysis I was seeking?

It is not very often that research in an academic milieu allows one to become deeply touched by something intellectually and emotionally all at the same time. This is, however, exactly what happened when I came in contact with ANT and ANTA. I was, and still am, greatly inspired by many of ANT and ANTA thoughts and doubts.

However, it is sensible to hesitate in writing an article about ANT and ANTA when two of the important characters in this context express the following thoughts about the idea of trying to summarise the history of ANT. John Law introduces his article from 1997 with the following questions: "What would it be to ´speak for a theory or a tradition in STS`[4]? What would it be to ´represent ´ that theory´? To offer an account? An authoritative account of its character, its development, its strengths and its weaknesses? …Perhaps there is no good answer. Or perhaps, on the contrary, there are many. But here is one possibility. That one might represent actor network theory by performing it rather than summarising it. By exploring a small number of case studies rather than seeking to uncover its ´fundamental rules´. To do this we would need to tell stories, stories about noise. Actor-network noise. The kinds of noises made by actor-network theory. Noises on. Noises off."[5] Why even make a try when Bruno Latour writes in his article from 1999 as follows: "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."[6]

This paper is the story of the intellectual and emotional journey I have made during the last year, and during which the touching and shaking forces were, and still are, ANT and ANTA. What I hope to achieve with this paper is to clarify my own thoughts and thereby hopefully also invite others to explore ANT and ANTA. I will use this text as a space within which to formulate a number of questions.

In this article, I explore the actor-network theory from various perspectives. As the 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"[7]. 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 core articles of the ANT research in general.[8] In this article, Callon works with many of the central notions and concepts which have gradually become the heart of ANT, and which have been developed further and discussed by many other ANT writers. Personally this article was for me *the* ANT article that awoke my interest in ANT in general. My intention here is to show how I have tried to analyse my empirical material by finding inspiration and intellectual support from Callon´s article. The aim is both to show the possibilities and problemisations raised by ANT analysis. In the latter part of the paper I will return to my empirical material and see how the ANTA approach can broaden ANT analysis, and I will hopefully indicate some directions in which it would be possible to travel both with the empirical material and the analytical work.

[4] STS = Science and Technology Studies
[5] Law, 1997, p.2
[6] Latour, 1999, p.15
[7] Callon, 1986
[8] See for example http://www.comp.lancs.ac.uk/sociology/ant-a.html

I will discuss the concepts of ANT and ANTA. I have read a number of the articles published between 1980 and 2000. These approaches give the opportunity to look at some of the definitions, some of the developers, the time perspective and the topics and issues with which the ANT researchers have been working. The implicit question when choosing texts within a time interval of twenty years and reflecting them against the sarcastic statement about the coffin and four nails made by Bruno Latour is how much ANT has changed during the time period. Have the changes left something untouched so that one can still talk about certain fundamental characteristics of ANT and possibly even locate these in the ANTA approach?

One more road leads to the crossroad mentioned at the beginning of this article. 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 equality studies and starting from ready-made definitions of exclusions and inclusions, I have been more interested in working with concrete information technology practices situated locally and in letting these practices define what information technology is all about. My choice of topic and approach was influenced by my own experiences of information technology. I did not recognise the way the government bills and other official documents[9] limited themselves to the technical side of information technology training and professions because that narrowness did not exist in my own practices. What I was interested in working with was the question of if, and how, borders are drawn e.g., the border between the social and the technical, and that drawn between people and artefacts. 'Are these borders transgressed in local practices?' was also one of my research questions. The texts, issues and topics of ANT and ANTA I have read, the way I have read them and my interpretations are strongly influenced by feminist epistemological discussions.[10] These discussions concern how scientific stories are told, and by whom and for whom they are told. The issue relates to what 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 which have guided my ANT reading.

[9] See for example the sub-report from Jämit, Jämställdhet och IT : delbetänkande från Jämit [The Gender Equality Council for Transport and IT "Gender Equity and IT], Stockholm, 2000

[10] See for example Sandra Harding: The Science Question in Feminism, Ithaca &London, 1986; Haraway, Donna: Simians, Cyborgs, and Women: The Reinvention of Nature, London 1991;
Haraway,Donna: Modest_Wittness@Second_Millenium.FemaleMan©_Meets_OncoMouse™ : Feminism and Technoscience, New York & London, 1997

How Did I and ANT First Meet?

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 discourse analysis of the official information technology texts[11] was manifested in two main statements. When talking about and framing information technology in the Swedish context in the late 1990s, it is possible to identify two strong ideologies, 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, the discourse analysis. 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 discoursive 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 mess, a confusion, and 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 something else which would hopefully be somewhat clearer, purer, or, to sum it up, something "more information technology"-ish? These were my first desperate 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".[12]) In this article, Callon identifies how the engineers employed by the Electricité de France (EDF) initiated a development project which was intended to create a new type of vehicle which does not use fossil fuel as a source of energy but electricity instead.

[11] Ekelin & Elovaara, 2001
[12] Callon, 1986

The story of the VEL

Michel Callon´s story about the electric vehicle is not only a story about one specific car but also a more general story about projects, involvements, money, future, actors, actions and effects. It is a story about an institution which initiated a development project. This institution was not capable of working alone with the project because of its size and complexity. The institute started to identify partners they could co-operate with by analysing what kinds of expertise would be valuable for the project. After identifying these, the next phase was to persuade the companies, organisations and municipalities to accept the project description. The partners with whom the original innovator wished to collaborate did not need to have similar motives or reasons for participating in the project. What is very important to note when talking about the partners is that Michel Callon does not speak about the social world in the sense of human beings and their social orders. Several non-human elements and entities, such as fuel cells, were as important for the project as for people and organisations: "None of the ingredients can be placed in a hierarchy, or be distinguished according to its nature. The activist in favour of public transportation is just as important as lead accumulators which may be recharged several hundred times."[13]

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 seek 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. Besides the empirical story, Michel Callon works on a metastory level. To be able to describe, analyse and understand the project he uses a vocabulary consisting of concepts 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 move to another context when telling other stories.

There were three key reasons why I was touched by Callon´s story. First of all, there were the transportable analytical concepts, as discussed above. Another important factor was that Callon´s story is about practices and/or how ideals, dreams, visions become transferred into practices, and what is lost or gained in these

[13] Callon, 1986, p. 23

transformations. Finally, I was moved by the way in which Michel Callon emphasises both humans and non-humans as actors in formulating his goal as follows: to "abondon the constricting framework of sociological analysis with its pre-established social categories and its rigid social/natural divide." [14] These were the culminating epistemological and methodological conclusions that both fascinated and teased me.

Concepts in the VEL article

In the following discussion I shall look at some of the key concepts Callon uses in the VEL article. First, let´s see what Callon says about the concepts of actor, actor-world, human and non-human.

Actor and actor-world

In order to illustrate what he means first by actors, 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.[15] As a reader, one might be interested to know how these entities became the actors they were and what these actors contributed to the development project. Michel Callon´s answer to these questions is: "[the actors]…act, react and cancel each other out, in just the same way as any others."[16] The actors are active in a context, in relation to each other. The entities become actors when they are related to other actors. The relational existence is called the 'actor-world' according to Michel Callon. ´Actor-world´ is the answer to the question "Of what and of whom is society made up?" [17] What does Michel Callon say about the actors in the different actor-worlds? In what way do they act in relation to one another? Do some actors have power over others? Is there a difference between small and large actors? What about the human and non-human actors? One could say that the actors have no pre-defined existence as actors in a specific context. The 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."[18] Here is something to keep in mind: the actors are not small or large per se, but it is the empirical case that both determines and shapes their size. Putting it very simply, the actors are not small or large, but their size is a result of being an actor in actor-worlds; and being an actor itself is also an effect of relations in the actor-world. 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

[14] Callon, 1986, p. 34
[15] ibid, p. 20
[16] ibid, p. 22
[17] ibid, p. 20
[18] ibid, p. 22

as important as lead accumulators which may be recharged several hundred times."[19] Formulated in another way: "in the absence of one ingredient the whole would break down."[20] These are very strong statements about the equality of non-humans and humans in the actor-worlds. The lead accumulators are as important as activists. Now we have the heterogeneous world of actors, an actor-world, which is needed if one wants to construct the electric vehicle. There are still a number of questions that remain, however.

Translation – spokesman, obligatory point of passage, displacement

We might ask, how do the different actors become involved in an actor-world? In order to find some answers to this question, we have to have a look at the concept of translation.

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." [21] Again Callon reminds us that the actors, who and whatever they are and how they act, are not pre-defined and fixed in advance. It could be easy to depart from previous practices, processes and projects where one could find actors with 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. The 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´s start by looking more closely at the translator-spokesmen. 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."[22] He also says that "the translator is thus the spokesman of the entities he constitutes".[23] As I understand 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 also defined. What the translator-spokesman actually does is negotiate. How can

[19] Callon, 1986, p. 23
[20] ibid
[21] ibid, p. 24
[22] ibid
[23] ibid, p. 25

one make the actors become interested 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?

As a reader, one might also ask if the potential actor could offer resistance or even refuse to take part/collaborate? Callon maintains that the task of the translator-spokesman is not an easy one: "since entities are not easily translated the destiny of most spokesmen is thus to be brutally contradicted."[24] He continues: " …no translation can be taken for granted for it does not occur without resistance."[25]

Be that as it may, some of the translations are successful, with the actors accepting the roles and identities reserved for them. 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 and 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. There can be several obligatory passages e.g., a scientific and research laboratory in the case of the electric vehicle. The fuel cells must pass the laboratory in order to be able to act in the VEL project.

The obligatory points of passages do not lie that far away from the third aspect of translations, namely, displacements. The processes and results of displacements will work as "links necessary to make the entities accept certain spokesmen and certain points of passage."[26] 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.[27] It is easy to understand why these displacements are essential in translations. It is because the spokesmen need to have authority behind their own arguments in order to convince listeners that what they say is scientifically valid and/or publicly supported. The displacements become a sort of voice amplifier. In the same way, articles, reports and books can be used in convincing the entities of

[24] Callon, 1986, p. 25
[25] ibid, p. 26
[26] ibid, p. 27
[27] ibid

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 that he shows 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."[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 so that he tells three different stories about the VEL at the same time. Instead, he wants to strengthen the idea that it is not possible to understand phenomena either as social, technical or economical but that all these aspects are so integrated and involved that the social would not be possible without the technical and vice versa. He also reminds researchers not take either of these parts or aspects for granted, or see them as self-evident.

Simplification

The third central concept in the above mentioned article is simplification. When starting reading and going through the process and paths, actors and translations, one might gain the impression that the story is almost too simple. This is exactly what Callon says about actor-worlds, that they are simplifications. The actors have more faces than those immediately apparent in the present actor-world. The actor-world does not just need all the possible qualifications of each possible actor. For the VEL project, for example, it was sufficient to limit the scale and function of the actors. [29] For one short moment, the actor-world was unified and stabilised.

There I was standing with my messy and confusing empirical material on the one hand and with the concepts of Michel Callon on the other, when the idea of trying to use Callon´s approach in my own material was formed. In the next section, I will describe some of my empirical questions and solutions as they are mirrored against Callon´s ideas. The story told also relates great difficulties in interpreting and implementing the ANT approach. I will also show how easy it was for me to end up with a highly instrumental use of ANT. The reason why I wish to show problems and knots so openly is that I am convinced that the latter are not just my private research problems, but can tell a more general story about how an analytical research approach can shrink and be transformed into an instrumental model.

[28] Callon, 1986, p. 28
[29] ibid, pp. 28-33

What About Information Technology? – Part One

The story of Michael Callon seemed to be very robust and coherent. Something in it, however, really niggled me. In the beginning this was based on a vague feeling that Michel Callon´s story of the electric vehicle was, in some strange way, not that far away from my own research questions. I started to articulate my feelings. Was it possible to transport the VEL story to southeast Sweden and a discussion of information technology?

In order to find some answers to this question I had to divide Callon´s article into more detailed components. I wanted to see if the idea of transportability 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, as already mentioned, 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. One can say that 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.[30] 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? What do we count as knowledge? 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 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

[30] Trojer, 1995, p. 49

does not influence the object that is represented".[31] 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."[32] 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.[33] Donna Haraway speaks about situated knowledges which do not refer to a place but instead to what she describes as situatedness [34], 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".[35] 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."[36] This freedom of choice also reminds me of the responsibilities

[31] Landström (a), 1998, p.44
[32] ibid
[33] Haraway, 1991, p.189
[34] Haraway, 2000, p. 71
[35] Haraway, 1991, p. 196
[36] ibid, p. 187

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."[37] 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"[38], and we should also add, what it means to write "formula, diagram and tables".[39]

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

[37] Law, 1998, p. 88
[38] ibid, p. 90
[39] Mörtberg, 2000, p. 56

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. If the research field is information technology and its many shapes, Blekinge is a rich region from which to collect empirical material.[40] 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 Kunskaps-samhället"; 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."[41] 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 to1999. This means that I had a framed project which was comparable with the VEL-project in terms of frames for a story and concrete practices.

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[40] 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

[41] The Bruk Project; Elovaara: 2001, pp. 48-54

ANT-concepts

Thus far I had been able to collect the elements of story, space, time, and project. Now I had to test if I could use the same analytical vocabulary as Michel Callon, namely the concepts of actor, translation and simplification.

A list of all the entities collected from the project documents and discussions with people involved in the project includes the five municipal libraries, the university library, the head librarians, the Vice-Chancellor of the university, the European Union regional office, the association IT-Blekinge, money, computers, librarians, video conferences and small and medium-sized entrepreneurs in one breath. If I follow in Michel Callon´s footsteps I need something more than a list of separate entities. The entities become actors only in relation to each other. To be able to locate these relations I needed to introduce the concept of translation, and more particularly, the concept of translator-spokesman. Was there a parallel entity to the French EDF which initiated the whole VEL project? Who enrolled the other entities? Bearing in mind that I was personally involved in the library project during its initial stage, I could claim that it was the university library that was in some way the initiator. In saying this I have already decided to exclude other actors and translations and shape an actor-world where the actors are identified by me, the ANT writer. It is important once again to remember that each actor-world is a world of its own, located and situated. This means that in other actor-worlds the university library would have been another kind of actor and perhaps not in a position of a translator-spokesman. The way I understand Callon´s story, this is exactly what an ANT writer has to do, to cut off in order to be able to tell an ANT story; this cutting and framing is especially necessary when trying to tell an ANT-influenced story about information technology. It once again tells us that ANT stories are not universal; on the contrary, they are highly local. They are stories told by writers who themselves are also located and positioned somewhere. In a similar way, the stories told about information technology are located and positioned somewhere.

How did the university library act as a translator-spokesman? It contacted the five municipal libraries to encourage them to join the project. The university library could give them a position in the project organisation, a part to play in the project application and - if they were successful in searching for funding - also access to computers, other IT artefacts, software, staff, training, and membership of an IT-network. In addition to these reasons, there was another motive for the municipal libraries for taking part which was connected to regional and even national IT development. They considered that taking part in the BRUK project would give them visibility and status locally, regionally and even nationally.

Once the translator-spokesman had enrolled the libraries other actors were needed. First the Vice-Chancellor of the university. The project needed him to give a wider context and greater political weight to the project. What made the Vice-Chancellor interested and involved was the idea of developing infrastructure for distance education and also the social approach of the project with regard to political debates about ´haves and haves not´ in the context of information technology. The association IT Blekinge was interested because they had as their mission and goal to encourage and support as many IT-related projects as possible in the region.

I have mentioned some of the non-human elements figuring in the project. Computers and other IT artefacts became actors. In order to give training courses, the libraries needed hardware and software. The whole project would never have been built up without the non-human actors. The latter were actors when activities were planned during the project time and they stimulated many discussions and caused problems concerning updating, compatibility, technical interface and usability.

Let´s move to the obligatory points of passage. In Callon´s story, the whole Vel project was an obligatory point of passage. It is possible in a corresponding way to state that the BRUK project as a whole was also an obligatory point of passage. The libraries would eventually never have been able to invest as much money in IT artefacts if they had not participated in the project. The project gave them the publicity they wanted in the together with other IT actors in the region. The project also gave the participating libraries publicity outside the county. The participants were, for example, invited to inform about the project in several national library conferences. We can say that the regional office of the European Union was an obligatory point of passage. The project needed financing and it was this office that administered much of the IT funding in Blekinge in 1998. The project had to travel via this office. When looking for the third form of translations, namely displacements, we can find protocols, applications, meetings, demonstrations and goal descriptions. The project was displaced but at the same time it was consistently one and the same project.

Callon speaks about simplifications. The libraries are much more than a partner in an information technology project. For the project itself it was only the interest for information technology that was needed. There was no need to include other activities central to public libraries such as children´s literature, library services for hospitals, just to give a few examples of the extensions outside the BRUK project.

The 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.[42] 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.

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 discourse analysis, I had found that there were two main ideologies when talking about information technology, namely the social and the technical.[43] 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

[42] see for example Harding, 1987, p. 2
[43] Elovaara, 2001

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?

At the same time, I was unhappy about my own work. The messy empirical material had been transformed into a very neat, coherent story. I had created a plain structure, where everything seemed to have a well-defined place and function. The story showed a project that was very stable and univocal. I really had succeeded in my efforts to find out understanding why the BRUK project had been initiated, why things had happened in the way they had. I had followed the project in a linear, chronological order, step by step. I had identified actors, translations and simplifycations. I had moved above my material, but had I really returned to and inside it?

Was the project really this simple and one-dimensional? Were there really no contradictions? Was everything as smooth as I had presented it? Was there no resistance? Was the actor-world my own creation? Was I really conscious of the elements outside the actor-world? Was the actor-world too stable and static? Was it too chronological? What was my story part of? Did it participate in and enforce the dominating IT discourses of the region? When reading more carefully my own story[44] I could actually find some traces of disordering. While reading the material carefully I met one of the librarians involved in the BRUK project. She was talking about the activities and target groups, and relating them to the core ideology of public libraries in the Nordic countries. The official project focused on the small and medium-sized enterprises as the target group, and yet the librarian was talking about senior people and their democratic IT rights. Contradictions were also present when she talked about her colleagues, who were hesitating at spending six million Swedish crowns on computers. The voices showed that there were cracks in the clean facade of information technology which I had created.

I also felt uncomfortable about the way I was trying to implement Callon´s vocabulary for my own purposes. Was I not just trying, in a very instrumental way, to create a model into which I could insert my own empirical material and reject what did not fit? For the moment I wish to leave these questions here, but I will return to them when discussing the ANTA approach later in this paper.

[44] Elovaara, 2001

What is Actor-Network Theory?

What makes it terribly difficult and complicated even to try to write about ANT 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 might 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 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 has been occupied with. This way of talking about ANT can also enable one to follow the ways ANT has changed during the 20 years of its existence.

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.[45] 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".[46] 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 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

[45] http://www.comp.lancs.ac.uk/sociology/ant-a.html
[46] Callon, 1980

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][47], 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." [48] 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". [49] 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´. [50] 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.[51] 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.

[47] Callon 1980, p. 218
[48] ibid, p. 199
[49] ibid, p. 203
[50] ibid, p. 200
[51] ibid, pp. 200-203

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´. 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." [52] 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…"[53]

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. [54] 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." [55] 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

[52] Callon, 1980, p. 208
[53] ibid, p. 209
[54] ibid, p. 209
[55] ibid, p. 210

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." [56] This is what Callon means by socio-logical. [57] Translations are thus about relationships. First of all, even if problems may be defined in different ´territories´ [58] 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. [59] It is only tagging along which describes a successful translation. [60]

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". [61]

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

[56] Callon, 1980, p. 211
[57] ibid
[58] ibid
[59] ibid, p.213
[60] ibid, p. 214
[61] ibid, p. 198

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…"[62] 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

[62] Callon, 1980, p. 217

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´ [63] 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

Earlier in this paper I explored Michel Callon´s article of the electric vehicle, "The Sociology of an Actor-Network: The case of the electric vehicle". In this section I only 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.

[63] innocent compared to existing sociological concepts

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."[64]

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."[65] Callon also adds, as in the case of translations, that ´simplification is never guaranteed. It must always be tested.´[66] Entities in actor-worlds are entities only in relation, or as Callon puts it, in juxtaposition to other entities. [67] 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 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." [68] Once more, it is the relations between the actors that forms the structure of a network. Again, there are no relations without

[64] Callon, 1986, p. 28
[65] ibid, pp.28-29
[66] ibid, p. 30
[67] ibid
[68] ibid

simplifications. Behind these simplifications there are other simplifications and juxtapositions, or as Callon formulates it: " a network 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." [69] Finally, the "actor-world is a network of simplified entities which in turn are other networks."[70] 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 1986 : Long-Distance Control

The same year as Callon published his article about the central concepts of ANT, John Law wrote an article about long-distance control. [71] 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

[69] Callon, 1986, p. 32
[70] ibid
[71] Law, 1986

history. The main question Law asks is: "how to manage long distance control in *all its aspects*."[72] 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. "[73]

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. "[74] 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. [75]

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.[76]

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

[72] Law, 1986, p. 235. Italics as in the original text
[73] ibid, p. 235
[74] ibid, p. 238
[75] ibid, pp. 238-239
[76] ibid, pp. 240-241

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.[77] 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.[78] 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[79] 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."[80] 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 long-distance 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.

[77] Law, 1986, pp. 245-249
[78] ibid, pp. 251-254
[79] 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 1985, and Callon´s and Bruno Latour´s article about unscrewing the big Leviathan from 1981
[80] Law, 1986, pp. 235-236

The year 1992: Networks

In 1992 John Law was working with the notion of network.[81] 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 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."[82] 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".[83]

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

[81] Law, 1992
[82] ibid, p. 379
[83] ibid

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."[84] 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[85] 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."[86]

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."[87] 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."[88] 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*."[89] 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. [90] 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?"[91] 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."[92] 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

[84] Law, 1992, p. 381
[85] I remind that the synonymy for ANT is ´sociology of translation´, see for example Law, 1992, p. 280
[86] Law, 1992, p. 381
[87] ibid, p. 383, Italics as in the original text
[88] ibid, p. 383
[89] ibid, p. 383, Italics as in the original text
[90] ibid, p. 382
[91] ibid, p. 384
[92] ibid

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."[93] 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)."[94] 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."[95]

[93] Law, 1992, p. 385
[94] ibid, p. 386. Italics and quotation marks as in the original text
[95] ibid, 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?"[96] 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.[97] 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 long-distance 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. [98]

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."[99]

The year 1997: Moving towards ANTA

In 1997, John Law talked about "traductions and trahisons".[100] 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."[101] 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.

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[96] Law, 1992, p. 387
[97] ibid, pp. 387-389
[98] ibid
[99] ibid, p. 389. Italics and quotation marks as in the original text
[100] Law, 1997
[101] ibid, p. 2. Bold as in the original text

Let´s start with Madeleine Akrich´s story from 1993: "The Description of Technical Objects".[102] 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."[103] The next notion relates to the heterogeneity of the network. There are cotton, farmers and pests; "all the elements have similar status."[104] The actors in this story are both humans and non-humans, and "…all [are] equally able to act upon one another."[105] 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."[106] 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."[107] The final remark about the ANT features concerns the translation: "translation implies both similarity and difference."[108] 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?"[109] John Law´s answer to this question is both 'yes' and 'no'. There are similarities, but also differences. He is not

[102] Law, 1997, p. 20
[103] ibid, p. 5
[104] ibid
[105] ibid
[106] ibid
[107] ibid
[108] ibid
[109] ibid, p. 6

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´[110]. Law maintains that ANT is not a single and unified theory but is related to other theories, fields of research, and methodologies. 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.[111] 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."[112] 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."[113] Law also talks about heterogeneity, but now he is referring to things that are

[110] Law, 1997, p.6
[111] Law, 2000, p 3
[112] Law, 1997, p. 6
[113] ibid, p. 12. Bold as in the original text

unassimilable, "that cannot be told or performed within a single network, from a single place, or to a single point."[114] 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.[115] 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".[116] 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."[117] 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

[114] Law, 1997, p. 13
[115] ibid, pp. 12-14
[116] Law, 2000, p. 5
[117] ibid

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."[118] 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."[119] 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."[120] John Law retains the core thought behind ANT, that "all entities are initially (only initially) equal and indeterminate."[121]

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 relations 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."[122] 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 funct-ionality.[123]

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."[124], 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."[125] 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

[118] Law, 2000, p. 5
[119] ibid
[120] ibid
[121] ibid
[122] ibid, p. 6
[123] ibid
[124] ibid
[125] ibid, p. 7

has happened to social criticism?"[126] 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."[127] 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."[128] 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,"[129] 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

[126] Law, 2000, p. 7
[127] ibid, p. 8
[128] ibid
[129] ibid

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."[130] 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."[131]

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."[132] What becomes central to this version of ANT is mobility, displacement and accountability.

[130] Law, 2000, p. 9
[131] ibid, p. 10
[132] ibid, pp. 10-11

The year 2000: Fluid and Fire

The final article I explore in my paper is from the year 2000.[133] 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 & Mol´s article is an invitation to elements causing tensions in networks. In order to talk about instability, Law & Mol use four different spaces as necessary and possible metaphors.

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´ perspectives.

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 & Mol start by talking about how ANT and even other studies of science and technology have discussed scientific facts. In the past, as Law & 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."[134] After working with how is science done, the next question to be asked was, where it is done? Researchers moved to laboratories. Law & Mol refer to research done by, among others, Bruno Latour, Karin Knorr-Cetina and Michael Lynch.[135] 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."[136] To establish how they do this, we must look for empirical answers, Law & 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."[137] If scientific facts are going to stay as scientific facts wherever they are

[133] Law & Mol, 2000
[134] ibid, p. 2
[135] ibid, p. 3
[136] ibid
[137] ibid

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*."[138] 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 & 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."[139] 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 & 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 & 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 & 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."[140] 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.

[138] Law & Mol, 2000, p. 3. Italics as in the original text
[139] ibid, p. 3
[140] ibid, p. 4

This is something we already know, or at least can understand, when we read Law´s & 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 & 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."[141] 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. [142] Secondly, Law & Mol also maintain that: "in earlier versions actor-network theory tended towards a functional managerialism."[143] 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

[141] Law & Mol, 2000, p, 5
[142] Latour, 1999, pp. 15-16
[143] Law & Mol, 2000, p. 5

technology at the time. It is exactly here Law & Mol introduce the two other spatialities: fluid space and fire space.[144] 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 in more detail, we must repeat 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 & 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 & 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."[145] 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´.[146] The obvious question becomes: Is the bush pump the same pump when it changes shape? To answer this question, Law & 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 & 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 & 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´.[147] This is remarkable when it comes to this new space, the fluid space: "…a world in which shape continuity *precisely demands* gradual change…"[148]

The fourth space Law & 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 & Mol introduce the new space, the fire space, because they wish to have a metaphor that is capable of including ´abrupt and discontinuous movements´[149] The fire space metaphor is also necessary when talking

[144] Law & Mol, 2000, p. 5 and 7
[145] ibid, p. 5
[146] ibid
[147] ibid
[148] ibid, p. 6. Italics as in the original text
[149] ibid, p. 5

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."[150] 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 & 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."[151] 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?[152]

What about Information Technology? – Part Two

In the previous section I started to discuss connections between empirical research and ANTA perspectives. In order to be able to give some examples from my own work, 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 several 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.

[150] Law & Mol, 2000, p. 5
[151] ibid, p. 9
[152] See for example Star, Susan Leigh: Invisible Work and Silenced Dialogues (1991) and Star & Strauss: Layers of Silence, Arenas of Voice (1999)

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. [153] 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? Were the network metaphor and translator-spokesmen concept the channels by which I could come to the ´underground´ of the project?

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´[154] 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

[153] see for example Latour, 1999; Law 1999, 2000
[154] Lykke, 1996, p. 23

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."[155]

Vicky Singleton´s text about the cancer screening program in England is another example of multilayered ANTA writing. The reasons and motives for women should join the screening programme articulated by the medical professionals were not coherent, and it was this incoherence Singleton wanted to show the readers. She chose to present the incoherences in the form of a conversation. She stated a question and gave two opposite but equally adequate answers. She threw light upon three simultaneous issues of writing: the epistemological choices of the writer, the contradictions present in the empirical material, and the form of writing.[156]

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"?[157] How can one tell a "both, and, neither, nor story"?[158] 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…"[159]

[155] Landström (b), 1998, p. 1
[156] Singleton, 1996
[157] Law, 1998, p. 102
[158] Haraway, 2000, p. 172
[159] ibid, p. 207

ANT & ANTA – a Concluding Discussion

My intention is not to draw a firm dividing line between ANT and ANTA. There are several reasons for not doing this. It is vital to keep in mind that neither ANT nor ANTA is one single thing. 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 both make it legitimate to talk about ANT and ANTA as separate approaches and also legitimate 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.[160] There exist 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 comparison is, of course, unfair both to ANT and ANTA because it is an oversimplification and reduction even if it hopefully captures some of the core issues of both ANT and ANTA.

ANT is always local and situated, as is ANTA. ANT is about heteregeneous actors, as is also ANTA. ANT is about metaphors, and so is ANTA. ANT tells techno-scientific stories, as does ANTA. ANT is about heterogeneous materialities, as is ANTA. ANT says it could be otherwise, so does ANTA.

ANT moves upwards, and above empirical material; ANTA moves downwards, and inside empirical material. ANT is about reductions and simplifications; ANTA is about complexities. ANT is about flat networks, ANTA is about multidimensional relations. ANT is often about hegemonies, ANTA frequently concerns otherness. ANT is often about successful translations, ANTA frequently concerns contradictions and contraversions. ANT looks for stability, ANTA looks for instability and mobility. ANTA draws things together, ANTA draws things apart.

Accountability is essential for ANTA, is it also for ANT? The writing subject is present in ANTA texts, is it also in ANT texts?

Can there be ANT without ANTA and vice versa? This is a question that might well be asked. I would claim that it is reasonable to say that they both need and support each other. However critical we might be when talking about networks and creating managerialism, we must at the same time admit that things are working. Computers do find their way to libraries in Blekinge, and so does the funding. Librarians get

[160] thanks to John Law

their HTML editors and web pages are created. At the same time, computers do not always work and they become old and must be updated. The funding is not always constant but comes in drips and drabs. Librarians need to negotiate and compromise. Fellow librarians are hurt. Web pages need time and effort when being updated. Local stories are part of larger global stories, which, when it comes to information technology, are both success stories and stories about unbalance and ambivalence. The stories co-exist and need to be told in one breath.

ANT and ANTA have the same epistemological and theoretical basis. Using a common ground they understand the world as a mixture of heterogeneous materialities. In everyday life, this is not a difficult thought to accept and live with. We are so connected to, and dependent on, our artefacts, machines and animals. To move everyday experiences into empirical research is more difficult. Or is it, in fact? Herein, as I understand it, lies one of the problems of ANT and ANTA. It is easy and uncomplicated to state that our world is material, but what does this really mean when we come to empirical research about information technology? Can we just transform our deeply rooted worldview based on borders and boundaries by just saying that as easily as we can follow the librarians we can follow the computers. What makes me uncomfortable is the easiness with which this seems to be done. Is this enough, however? What else is demanded if we claim that we do not accept the borders drawn between the social and the technical, and between the humans and the non-humans. What is the great project of ANT and ANTA? Do we move on a philosophical-epistemological level in order to create new languages and new stories and thereby a whole new way of understanding the world? Are ANT and ANTA to be understood as ways of simply formulating the same understandings in a scientific manner we recognise from everyday life, that life is a mixture of humans and non-humans? Do ANT and ANTA research approaches claim that in the same way as we cannot live our lives without machines and other artefacts, we cannot tell scientific stories about our lives without involving all potential actors? What would then come after the phase which I could call a realistic perspective account?

What I see is a very close connection between feminist science and technology studies, ANT and particularly ANTA. The connections is made of the techno-scientific world of humans and non-humans.[161] It is also made of metaphors, particularly once the rigid notion of the network has been problematised. ANTA is looking for what the feminist science and technology studies have already found, namely the metaphor of the cyborg. ANTA is looking for what feminist science and technology studies have been working with for a long time, namely otherness, accountability, partiality and situatedness. Donna Haraway accuses ANT, without naming it, of playing wargames with a group of panhumans. [162] It might also be that

[161] Haraway, 1997 (a), p. 210
[162] Haraway, 1994

ANT and feminist technoscience have different geneaologies.[163] Feminist techno-scientific 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.[164] The distance between philosophically elegant French ANT studies and feminist technoscientific studies seems sometimes to be impossibly great. One could claim that many of the earlier ANT studies in particular have had a touch of ´standing nowhere and seeing everything´. Now when 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, but consciously starting to implode and change. It would be valuable to study more closely how ANT, ANTA and feminist technoscientific studies could open up a more articulated and friendly collaboration.

[163] Lykke & Markussen & Olesen, 2000, pp. 58-59; see f eg Bijker (1997), Leskinen (1994), Pickering (1992)
[164] Haraway, 1994, p. 69

Literature

ANT (2000)	ANT-bibliography, www.comp.lancs.ac.uk/sociology/ant-a.html
Bijker, Wiebe E. & (1997) Law, John	General Introduction in Bijker, Wiebe E. & Law, John (eds.) *Shaping* Technology/Building Society : Studies in Sociotechnical Change, Cambridge & London, The MIT Press, pp. 1-14
Bruk (1998)	The Bruk Project, www.ltblekinge.se/kultur/lansbibl/index.html
Callon, Michel (1980)	Struggles and Negotiations to Define What is Problematic and What is Not : The Socio-logic of Translation in Knorr, Karin D. & Krohn, Roger & Whitley, Richard (ed.): The *Social* Process of Scientific Investigation. Dordrecht & Boston & London, D.Reidel Publishing Company, pp. 197-219
Callon, Michel (1986)	The Sociology of an Actor-Network: The Case of the Electric Vehicle in Callon, Michael & Law, John & Rip, Arie (eds.): The *Dynamics* of Science and Technology : Sociology of Science in the Real World. Houndmills, Basingstoke and London, The MacMillan Press, pp. 19-34
Ekelin, Annelie & (2001) Elovaara, Pirjo	Discourses and Cracks : A Case Study of Information Technology and Writing Women in a Regional Context. Karlskrona**,** Blekinge Institute of Technology. Licentiate dissertation, pp.16-36 A shorter version published in Balka, Ellen & Smith, Richard (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. Boston & Dordrecht & London, 2000, Kluwer Academic Publishers, pp. 199-207

Elovaara, Pirjo (2001)	Translating and Negotiating : Information Technology in Discourses and Practices, Ronneby, Blekinge Institute of Technology. Licentiate dissertation, pp.39-64
Haraway, Donna (1991)	Simians, Cyborgs, and Women : The Reinvention of Nature. London, Free Association Books
Haraway, Donna (1994)	A Game of Cat´s Cradle : Science Studies, Feminist Theory, Cultural Studies in *Configurations* 1, pp. 59-71
Haraway, Donna (a) (1997)	Mice into wormholes : A Comment on the Nature of No Nature in Downey, Gary Lee & Dumit, Joseph (eds.): *Cyborgs* & Citadels : Anthropological Interventions in Emerging Sciences and Technologies. Santa Fe, School of American Research Press, pp. 209-243
Haraway, Donna (b) (1997)	Modest_Wittness @Second_Millenium.FemaleMan©_Meets_OncoMouse™ : Feminism and Technoscience, New York & London, Routledge
Haraway, Donna (2000)	How like a leaf. An Interview with Thyrza Nichols Goodeve. New York & London, Routledge
Harding, Sandra (1986)	The Science Question in Feminism, Ithaca & London, Cornell University Press
Harding, Sandra (1987)	Introduction : Is There a Feminist Method? In Harding, Sandra (edited): *Feminism* and Methodology : Social Sciences Issues. Bloomington & Indianapolis. Indiana University Press, pp. 1-14
Jämit (2000)	Jämställdhet och IT : delbetänkande från Jämit [The Gender Equality Council for Transport and IT "Gender Equity and IT], Stockholm, Fritzes offentliga publikationer (Statens offentliga utredningar ; 2000:58)

Landström, Catharina (a) (1998) — En annan vetenskap? : Om att ta feministisk vetenskapskritik på allvar [An Another Science: About taking Feminist Science Criticism Seriously] in Blomqvist, Martha & Helmius, Agneta (red/ed): En *annan* vetenskap? : Feministiska föreläsningar om (teknik)vetenskaper? [An Another Science? : Feminist Lectures on (Techno)sciences. Uppsala, Centrum för kvinnoforskning, pp. 39-59

Landström, Catharina (b) (1998) — Everyday actor-network : Stories about locals and globals in molecular biology.' Göteborg, Göteborg University, Department of Theory of Science and Research. Doctoral Dissertation

Latour, Bruno (1999) — On recalling ANT in Law, John & Hassard, John (eds.): *Actor* Network Theory and After, Oxford, Blackwell Publishers/The Sociological Review, pp. 15-25

Law, John (1987) — On the methods of long-distance control: vessels, navigation and the Portuguese route to India in Law, John (ed.): *Power,* Action and Belief : A New Sociology of Knowledge? London & Boston & Henley, Routledge & Kegan Paul, pp. 234-263

Law, John (1992) — Notes on the Theory of the Actor-Network: Ordering, Strategy, and Heterogeneity in *Systems* Practice, vol.5, no 4, pp. 379-393

Law, John (1997) — Traduction/Trahison – Notes on ANT, www.comp.lancs.ac.uk/sociology/stslaw2.html

Law, John (1998) — After Meta-Narrative : On Knowing in Tension in Chia, Robert C.H.(ed.): In the *Realm* of Organizations : Essays for Robert Cooper. London & New York, Routledge, pp. 88-108

Law, John (1999) — After ANT: Complexity, Naming and Topology. In *Actor* Network Theory and After. Edited by John Law and John Hassard. Oxford, Blackwells Publishers/The Sociological Review, pp. 1-14

Law, John (2000)	Networks, Relations, Cyborgs: On the Social Study of Technology, www.comp.lancs.ac.uk/sociology/soc042jl.html
Law, John & Mol, Annemarie (2000)	Situating Technoscience : an Inquiry into Spatiality, www.comp.lancs.ac.uk/sociology/soc052jl.html
Leskinen, Jaakko (1994)	Tiede, teknologia ja kulutustutkimus [Science, Technology and Consumer Research]. Helsinki, National Consumer Research Centre. Publications 12/1994
Lykke, Nina (1996)	Between Monster, Goddesses and Cyborgs: Feminist Confrontations with Science in Lykke, Nina & Braidotti, Rosi (eds.): *Between* Goddesses and Cyborgs : Feminist Confrontrations with Science, Medicine and Cyberspace. London & New Jersey, Zed Books, pp. 13-29
Lykke, Nina & Markussen, Randi Olesen, Finn (2000)	"There are always more things going on than you thought!" : Methodologies as Thinking Technologies in *Kvinder*, Køn & Forskning 4, pp. 52-60
Mörtberg, Christina (2000)	Teknikvetenskap och genusforskning eller Creating Better Worlds Through Imaginations [Technoscience and Gender Research or Creating Better Worlds Through Imaginations] in Trojer, Lena et al: *Genusforskningens* relevans : Slutrapport från integreringsarbete i åtta svenska forskningsråd [The Relevancy of Gender Research: Final Report of Work of Integration in Eight Swedish Research Councils], Bilaga 5 [Appendix 5], pp.50-68
Pickering, Andrew (1992)	From Science as Knowledge to Science as Practice in Pickering, Andrew (ed.) *Science* as Practice and Culture. Chicago and London, The University of Chicago Press, pp. 1-26
Regeringens (1995)	Regeringens proposition 1995/1996:125, Åtgärder för att bredda och utveckla användingen av informationsteknik [Government Bill 1995/1996:125, Measures to broaden and develop the use of information technology], rixlex.riksdagen.se

Regeringens (1999)	Regeringens proposition 1999/2000:86, Ett informationssamhälle för alla [Government Bill 1999/2000, Information Society for all], naring.regeringen.se
Singleton, Vicky (1996)	Feminism, Sociology of Scientific Knowledge and Postmodernism : Politics, Theory and Me in *Social* Studies of Science. Vol. 26, pp. 445-468
Star, Susan Leigh (1991)	Invisible Work and Silenced Dialogues in Knowledge Representation. In *Women,* Work and Computerization: Understanding and Overcoming Bias in Work And Education. Proceedings of the IFIP TC9/WG 9.1 Conference on Women, Work and Computerization. Helsinki, Finland. 30 June – 2 July 1991. Ed by Inger V. Eriksson and Barbara A. Kitschenham and Kea G. Tijdens. Elsevier, pp.81-87
Star, Susan Leigh & Strauss, Anselm (1999)	Layers of Silence, Arenas of Voice: the Ecology of Visible and Invisible Work in *Computer* Supported Cooperative Work 8, pp. 9-30
Trojer, Lena (1995)	Rena och orena fakta [Clean and unclean facts] in *Häften* för kritiska studier nr 4, p. 49
Uhlin, Åke (1983) & Stevrin, Peter	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

Appendix 1

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Together and Apart - a Story about a Distance Learning Course

Background

In this article, I will describe the background, the methods, something about the contents and the final evaluation of a distance learning course. The title of this course was "IT-pedagogy for librarians", and it gave five academic points. The course was organised at the University of Karlskrona/Ronneby, in southeastern Sweden. 30 students participated in this course, all of them professional librarians working both at public and academic libraries. Together with two colleagues, I was in charge of planning, teaching and supervising the course.

Before describing the actual course, I will give some brief background information. Only describing the course without its context would give only a narrow and incomplete picture. The core issue in this background story is information technology and the librarian's profession. These two issues are so intertwined that it is actually impossible to discuss them separately. Anyhow, the first focus is on the changing nature of the profession in itself. From being an expert in information search and being thereby also an intermediator and a gatekeeper, librarians are working more and more as guides and tutors, so that the so-called end-users themselves can locate information sources, design their information search and finally find the information they need. The main reason for this revolutionary change is the development of information technology, most often embodied by the Internet in this context. When these two aspects meet, the questions become: "How can we as librarians, instead of doing the job ourselves, teach other people to do it? How can we translate our expert knowledge, a combination of skills, theoretical knowledge and tacit knowledge, to be understandable for novices in this field?" Behind these questions lies a more comprehensive one: "What kind of place can librarians find for themselves in the larger landscape of information technology?"

I have to confess that it is almost embarrassing to write an article about a distance learning course in a Swedish context today. By saying embarrassing, I refer to the gigantic amount of projects, courses, articles and so on, available in Sweden nowadays. This also explains why I wish to start this story from an another viewpoint. Another reason is that the distance learning course I am going to present in this paper, was in itself only one step on a long road and in no way a final destination and goal. I will begin my story with the activities in which I was involved some years before and how all that led to the development and realisation of a distance learning course. One more reason for starting this story from such a long distance both in time and space, is to stress that my approach does not lie on the technical side of

distance learning, such as which software one should use. Questions I have worked with and which I also will explore in this paper are about how to formulate your own thoughts and ideas, when choosing a pedagogical platform. I will also describe some of the intentions and ambitions of the course, and how/if we succeeded in reaching them. I will also give some insights from the working methods that were used during this course and some of my own reflections and those of the students upon our mutual journey.

Some years before

I wish to begin by describing my own relationship with the Internet and relating my experiences of it. I do not claim that these are specific in any way, but hopefully they can give some understanding of why I ended up in developing an online course on using the Internet. During 1994 our paths crossed; the Internet and I met. I was extremely enthusiastic and willing to share my newly gained knowledge and know-how with my colleagues and others. At that time I was working as a librarian at the Centre for Women's Studies at Lund University in southern Sweden. To be honest, I have to admit that researchers and academics connected to this centre were not at all convinced about the possibilities for finding information and coming in contact with people with the same profession and interests. It was in this context that the idea of giving a training course in how to use the Internet was born and also realised. During 1995 I then left Lund and went on to the University of Karlskrona/Ronneby and started to work as an information specialist at the university library. With me, I had positive experiences of how we two trainers, Sara Goodman and I, had succeeded in showing that the Internet can be a helpful information source for gender researchers. I also brought with me the joyful feeling of how it was to develop a course of one's own and above all the excitement of working as a "teacher". In the autumn of 1995, I then started to co-operate with librarians working at public libraries in the county of Blekinge (in southeastern Sweden). The county library bought a package of courses designed specifically for librarians. The aim of these new courses was to give basic knowledge about the Internet and the possibility of hands-on training. The central aspect was to design course content that was tightly connected to the everyday activities and work of the librarians. The journey continued. After these first courses, designed to train Internet skills, the co-operation between the university library and the public libraries continued. During the years 1996-1997 we developed a project called "What kind of role do the libraries have in distance education?" In this specific course the participants themselves worked at a distance, using various Internet applications. We wanted to use ourselves, both the project leaders and the participating librarians, as guinea pigs in order to gain experience of how it actually is to work and study at a distance, so that experiences could generate thoughts and ideas about how to develop distance-spanning library services for students.

Please, stop!

It was when working with the above project, that I started to articulate something that I had been instinctively aware of during all those years when I had been teaching and training without actually consciously reflecting over my own pedagogical knowledge and skills. I had just done my work, sometimes successfully and sometimes less successfully. In other words, I had reached the ceiling in terms of giving skill-oriented hands-on courses. If I myself started to ask these more underlying questions about how and why, I discovered that my fellow librarians were wrestling with synonymous problems and issues. It was time to take a break and at the same time carry on.

A pedagogical course for librarians

So, in spring 1998 I started to discuss the development of a further education course for librarians together with Lena-Pia Hagman, head of the pedagogical development division at the University of Karlskrona/Ronneby. The course was given the name "IT-pedagogy for librarians". During the working process, we also decided that we wanted to give the course as a distance learning course. There were several reasons for this decision. We wanted to give a course, which did not demand travelling to the campus to listen to lectures or participation in seminars, which meant that librarians also living far away from the physical university campus could participate. The course was planned for librarians in working life, which also supported our idea of giving a course, which would allow the participants to choose the study hours most suitable and convenient for themselves. The third reason was that we really wanted to test the very idea of developing a course using the Internet, without getting fixated on the technical aspects of it. Finally, perhaps the most pragmatic reason for choosing a distance learning course was that during that particular period of time it was much easier to get financial support for distance learning courses than for ordinary campus-based courses.

Paper and pencil

What Lena-Pia and I actually started with was to pick up a double sheet of paper and a pencil. We divided the paper sheet in columns. A horizontal line across the whole sheet was our time line; it could be a day and time for a specific activity or a number of days reserved for a specific activity. On the vertical side of the paper we wrote several titles: activity, responsibility, pedagogy, the red thread, IT-support for a specific activity, IT-support common for all activities. Just to give an illustration of our paper and pencil technique, here is a brief illustration:

Time	Friday 3.30pm	10 days	Monday 10 am	3 days (and so on)
Activity	1.contact the group 2. send the topic out	Choose texts Send texts to the teachers Acceptance from the teachers Send the texts to the students Read Write a summary Pick up the topics for discussion Choose reserve texts	Send out the summary Send out the topics for dis-ussion	Read Think
Responsibility	Pirjo	1-2, 4-7 Group x 3, 8 Teachers	Group x	All students
Pedagogy	Introduction to conceptualis--ation	1.Indivualis-ation 2. Group as a resource	Analysis	Analysis
"The red thread"	Alternation between theory and practice →			
IT-support for a specific activity	E-mail WWW	1-4, 7-9 E-mail/WWW/ Fax	WWW WWW	WWW E-mail/Chat
General IT-support	Teachers reachable via e-mail	Student communication : e-mail, chat, WWW	IT-support on left run through all the activities	

By showing this basic planning work, I simply wish to emphasise that it was really something other than technical considerations that was central to our work. First of all we decided how we wanted to work on the course: focus on students' own work, alternation between working by oneself, in a topic group and all students together. We also wanted the students to use their own competencies and experiences as a source for reflection and discussion. After doing all this with the help of paper and

pencil, it was really easy to see what kind of Internet applications we would need. First of all, a home page had to be created, where we as teachers could publish manuals, instructions, all kinds of administrative materials and the study texts for the students about the topics of the course. We also wanted to have a home page where the students could easily publish their own texts, write and edit these texts in groups and individually, and even use the home page for communication via e-mail, chat and discussion groups. We also wanted to use the world wide web as the one and only interface for all these purposes. Our last claim was that we could handle all these tasks without being forced to use any html-editor and html-coding.

We contacted Leif Lagebrand who was employed by the university to develop IT-support for all kinds of educational purposes and he became a partner in the team with Lena-Pia and I. In the very beginning Len-Pia and I had dreamed of sending lectures and supervising online, both with images and sound, and keeping in touch with the students by Internet-based video conference systems, but we abandoned these dreams. The main reason for this was that our goal was that the participants could study at home, with rather slow data communications and without access to, for example, video conference equipment. So, we added this requirement of keeping a rather low technical profile when talking about different Internet-applications. Leif knew what we wanted and could show us some alternative software solutions.

The teacher team was never going to meet the students face to face, which meant that a lot of effort had to be invested in information and communication, both on the course home page and in electronic communication. From our own experience of using computer-based methods, we also knew that all instructions had to be easy to understand without any possibility for misinterpretations. So we published three different manuals, using everyday Swedish and trying to avoid technical jargon. "Let´s start", "How to use the course home page" and "How to study on this course" were the titles of these main manuals. They contained an awful lot of detail, but they were essential for a good flow. Communication from the teaching team to the students went through me. Direct technical questions were directed to Leif, our technician. I sent regular e-mails before every deadline and every assignment. The same information was also published on the course home page. The students could always send me questions, and sometimes after consulting the two other members of the team, I always tried to send the answers as soon as possible. If, for any reason, I was not available via e-mail, the students were informed about this and could contact me via a mobile telephone. I must emphasise that this extensive communication was necessary, because it was the only way to establish person-to-person contact in this virtual environment.

IT-pedagogy for librarians or, what did we study?

Now we had a framework or a basis from which to work. Parallel with this framing, we discussed the course content. Using my own experiences as a starting point, Lena-Pia and I decided to use an open pedagogical model which was based on the experiences and knowledge of the students and on very active student participation.

To sum up:
As a general framework the society around us: the location of the libraries, librarians and information in the information and knowledge society;

- knowledge; The different uses and aspects of the concept of knowledge: skill- based knowledge, experience-based knowledge and theoretical
- Introductory knowledge about general pedagogical ideas/ideologies and the method of project work;
- Focus on the essential pedagogical questions: why-what-who-how;
- The experiences of the participants as a source of knowledge
- A strong connection between theory and practice;

We also decided not to use a lecture based teaching style, but to work within groups and with five different topics:

- Information society – knowledge society – library
- Library training – user training – IT-pedagogy
- Information literacy
- Internet – to demonstrate, show, teach and train
- Library as a learning environment

We also ended up giving two lectures:

- Basic concepts of pedagogy
- Methods of project work

How did we work?

The students were divided into five working groups. We tried to mix the participants as much as possible: women/men and public librarians/academic librarians. Every group was in charge of one of the topics mentioned above. The actual topic was introduced via a short introductory text, published by me, with some references to literature on the course home page. But, I 'left the door ajar', so that the topic group could take over. Their assignment was to develop the topic further, by choosing texts together. To organise the work and duties within the group, they kept contact with each other mainly by e-mail, telephone and fax. The group had only one week

in order to find the texts. After choosing them, they sent the suggestions to the teachers, and after their acceptance the titles were published on the course home page, so that all others could also start to read. The group could mix articles, book chapters, reports and so on, and they could choose both printed and electronic texts. After this moment, the group continued to work together. Their goal was to read, analyse and summarise the topic by using the texts they had chosen and their own experiences. They also chose some topics for general discussion. Both the summary and the discussion topics were published on the course home page, so they were available for the rest of the students After a reading period, the next step was the general discussion on the Internet by using the discussion topics as the point of departure. The final task for the topic group was to write a new summary on the basis of the literature and the discussions. This new summary was also published on the web. After that, the next topic group took over and the new cycle started. This approach encouraged everybody to get involved, both in group work and in the common discussions.

In addition to these group-based activities, every participant wrote an essay in order to broaden the discussion around one of the five topics. The other assignment, which could be done either individually or together with a partner, was to choose ideas for pedagogical projects at the libraries where the participants were employed.

The teaching group consisted of three persons: a librarian, a researcher in pedagogy and a technician. The roles were quite clear. I was mainly in charge of the five topics and communication with the students. Lena-Pia was in charge of the two lectures on electronic communication and the pedagogical idea behind the course. Leif was in charge of the web pages and technical support. Our knowledge and experience complemented each other's in an excellent way. Since the teaching group was small, informal contacts were easy and at the same time no one had overall responsibility for the whole course. An ideal working situation, I would say. I am certain that our different experiences and competencies were essential.

How did it work?

One part of the examinations of this course was to write an evaluation. The teaching group formulated several questions, and we were extremely curious about the answers. We asked about the goal and the aim of the course. How did the students assess them after the course was finished? We also wanted students to comment on the methods and the ways of working during the course. Finally, we wanted to find out if there had been any problems with technology.

I only wish to comment on one of the aspects that was raised by the students when they were asked about the goal and the aim. Many had appreciated the time that was

reserved for reflection, but there were some participants who obviously lacked practical-pedagogical tips, such as concrete advice, for example, on how to make a training course on the Internet. From my point of view, I was not surprised at these kinds of comments. I had been in a similar position many, many times: a group of twenty students wanting to know how to find information. What to do? How? As a teaching group we could only respond that the very aim of this particular course was to find and provide room and space for a break and a moment of reflection. What do librarians see in front of them when they think about the future? If librarians are going to become trainers and teachers, what is the goal of their teaching? I can also understand that people working furiously to meet various demands for efficiency may consider simple thought and reflection a luxury that does not necessarily show any directly quantifiable input and immediate utility.

When talking about the methods and the ways of working during the course, many of the participants mentioned the variation between different styles, mostly in very positive terms. They observed that the course combined reading and writing, and the project work really gave them an opportunity to implement theoretical knowledge in everyday practice. It is very interesting to note in this context, a distance learning course given entirely by means of the Internet without any face-to-face meeting, that the single comment made by the all students was that they would have liked to have had at least one physical meeting in the "real world".

The most critical comments were about the group discussions and about time. Concerning the group discussions, many voices were raised about the size of the groups, inflexibility when talking about time, the absence of the teachers, the amount of repetition and superficiality and subjective liking and disliking during the discussions, and an insufficient and complicated online conference system.

As a teacher I can only agree with these comments. The software for the conference system was not very precise or user-friendly. It was hard to follow the lines of discussion: who was saying what, who was commenting on what. There was a time delay before one could see the replies so it was sometimes hard to make any sense of the whole discussion. One reason, apart from the technical aspect, was the size of the discussion group: 15 persons at one time. It was exactly as in an ordinary discussion in a regular classroom. A group of 15 is just too large. Some people talked a lot and some of just sat quietly without saying a word. The participants also had different views about the character of these discussions. Some wanted to see them as improvisation and really wanted to listen to others and comment on the ongoing discussion. Some of the participants had prepared arguments and statements beforehand (remember that the discussion topics were available on the course home page several days before the actual discussion). These people just wrote down their ready-made opinions, and that was that. They actually never participated in the ongoing discussion. One of the students commented on this by saying that it was the silent, shy and insecure ones who had these ready-made views and opinions. By this

she meant that it was the same people who would have been silent in an ordinary discussion in a physical room and their way of participating in this electronic one was just another way of remaining silent. Another aspect has to do with these virtual-only relations. The students did not meet each other, which they were critical about. They did not have any references to the body language of other students and thereby very little means of reading between the lines. The discussions were text-based and could therefore become quite plain and dry. They could not arouse enthusiasm or irritation, necessary ingredients for lively discussions.

The issue of time is very central in the context of distance learning. One of the arguments for the benefits of arranging distance courses has been that the students are free from the constraints of place and time. In order words, students do not have to travel and come to the campus and they themselves can choose when to study, day or night, without having to follow a ready-made inflexible schedule. This was not the case in this course. One of the bearing ideas when we planned this course was to focus on group work. We also knew that this would never be successful if were simply to say, "please, get on working but you can decide yourselves when to contact each other and when to work". We had to choose between a total flexibility and a certain degree of inflexibility. When we received these criticisms with reference to time, we counted the actual number of fixed times that were to be followed and respected, and discovered that the majority of the fixed times were deadlines. The only fixed time that really meant that you had to be connected to the Internet was the time for the general topic discussion, this was two hours every third week. I can see two reasons for the overestimation of the number of fixed hours. The first of the reasons is connected to the general idea about distance learning. You are supposed to have total freedom in deciding over your own time when you study using the distance learning approach. I consider this freedom speculation to be a myth. It is a sign that the argumentation for distance learning has had very few connections to any pedagogical discussions. Has the means become the goal? What pedagogical consequences do we get if we just state, without any hesitation and problematisation, that students are free in both space and time when they study by distance? Would that total freedom mean that, for example, working in groups would not be possible and most of the study time the student would sit alone at home? I feel that the solutions we adopt for teaching and studying have to be conscious decisions. We cannot simply say that we are going to use distance learning methods without bothering to address the limitations they might entail. We know, for example, that because group work would mean fixed times, we cannot use it because when you use distance learning methods you just do not have fixed times. The second reason, as I see it, has to do with the criticisms of the discussions. When the students felt that the discussions did not work, they also felt that they took too much of their time and they did not even have the possibility to choose that time.

When we asked about technology, we were surprised by the answers. No problems at all! I think that the main reason for this was our decision not to have real-time lectures. During the process we had also realised that the different chat techniques

available did not work for us. The first idea was to use freeware from the Internet, but this was absolutely impossible at many public libraries due to the firewall regulations. After that, we tried, or Leif tried, to install a chat server on the university server, but the software producer had only a rather old version and the upgraded one was not yet available. We tried to use a chat site on the Internet, but the private room the students created there was extremely unstable. Consequently, the communication technology used mostly by the students was electronic mail, telephone and fax.

Finally, some of my own personal thoughts. First of all I was very happy that so many librarians were interested in participating in a course which was absolutely not a hands-on course. I was also happy that some of them, who in the beginning had been disappointed due to the absence of hands-on training, wrote in their evaluations that they had really appreciated reading, writing and discussion. They felt that they were updated and eager to have conversations with their colleagues. This is important when reflecting back on some of the essays the students wrote and where they made statements that both librarians and libraries are invisible in the public information technology debates. Perhaps the participants on this course were now better prepared to take part in these discussions.

What also strikes me is how very useful the Internet is for distance learning. We used software, which was not designed for this purpose, but nonetheless gave us almost complete service and support. This also meant that we did not have to make any financial investments for this course (the software was already available at our university). I was also very grateful that the software was so easy to use both for me and for the students. A lot of time was left over to think about the contents and our working methods. I also realised how very useful our paper and pencil method had been. We knew what we needed in the way of IT-activities and IT-support, so it helped us to articulate our claims when talking with the technician. We were also given a demonstration of software designed specially for distance learning purposes. When we evaluated this particular program we realised that it worked contrary to our purposes. The software wanted to direct our work by giving ready-made pedagogical solutions. This was exactly something we did not want to have, namely software deciding which pedagogy we should use. It was exactly the opposite of the way we wanted to work, namely to find software that would support our pedagogical ideas. Here, I must point out that I am talking about the year 1998, and it is probable that software is more sophisticated today.

We were very positively surprised when we realised that group work was functioning. This was a great relief, of course, because group work was the basis of this course. We had had our doubts because we had heard rumours that if there was a risk involved in developing distance courses, it was precisely this; namely believing that group work, and especially communication within groups, would work. There are several reasons for our success, of course. One reason, something that was

beyond our control, was that it happened by chance. Besides this factor, we can also see other reasons. The students were highly motivated, so they were ready to use both their own working hours and their free time for studies. They had chosen this course because it seemed to be relevant to their own occupation. Another reason is that every group had a leader who was in charge of organising the group. The group leaders really worked hard and they all managed to keep the work going. Everybody in the group was given a sub-assignment and all these sub-assignments were dependent on each other, which also meant that the students were not only responsible for their own work, but for that of their fellow students as well. Even if the students did not meet, the first task they were given was to present themselves on the course home page. In that way, everybody had at least some information about other students. They also shared a common background as librarians and thereby also mutual experiences and understandings, a sort of common ground to stand on.

Working as a librarian means also that all the elements that the work assignments consist of can be seen as links in a long chain. All these links are dependent on one another and the next coming link is made possible if the earlier links are functioning well and are regularly maintained. To illustrate this collaborative nature of the profession, just follow the line from the cataloguing task to an inter-urban loan request. Being dependent means also responsibility. Being dependent on other persons´ work and also understanding that one´s own work is a part of complex structure, is perhaps not that often openly reflected in the professional discussions, but is an underlying necessity for the whole existence of library services. In this actual case, the participating librarians were able to successfully translate these relationalities, understandings of dependencies, mutual responsibilities and collaborations, to the group work ideology practiced in this actual course.

One of the basic features of this course was to allow students a lot of space. The most concrete sign of this freedom was that there were no obligatory text books. When I introduced the topics, I referred to some texts, but these were to be seen only as recommendations. It was the topic group who really had to search and find the literature to be read by the students. I was really amazed how really professional and competent the participating librarians were in this task. One can always claim that this would hardly work with students lacking this professional capacity. Of course, you cannot just transfer the success of one pedagogical endeavour to another context, but all pedagogy and methods have to be formulated so that they follow and support the experiences and backgrounds of the student group. I would still maintain that the issue of text books is relevant in all educational situations. Perhaps the bibliography would not be that comprehensive and exclusive if 'ordinary' students were to compile it, but it would provide good, realistic training in information search which is one of the goals for all higher education. It might also result in motivating students to read. It could also mean that the bibliographies would become more fragmented and perhaps even full of contradictions. What a wonderful basis for good debates!

When relating my experiences, I often get two kinds of questions. The first question is: Did you gain something extra by using distance learning? The second question is: Did you miss something by using distance learning? The answers I can give are, of course, only speculative. I cannot, for example, proffer any comparison, since this particular course has never been given as a campus course. I see this course very much from a teacher's perspective, which is also important to bear in mind. What did we gain? We had students from all over the country and even outside Sweden, even one student living in Spain. We as a teaching group were given a wonderful opportunity and challenge to really think about our own pedagogical ideas and thoughts, because we did not have any earlier distance learning experiences to fall back on. In one way, I came close to each student, though we never met. That we became to some degree acquainted was due to intensive and regular e-mail correspondence. What did we possibly miss? There were some students who left the course in the very beginning. The reasons for this are unknown, but it may have been partly due to some kind of disappointment. This disappointment can be traced back to the contents and the methods. Some of the students perhaps thought that the teachers were too invisible and too much responsibility was left to the students.

Finally, I wish to raise the issues of writing. This course was actually totally text-based: either reading or writing. The students who are good at expressing themselves verbally certainly managed and perhaps even enjoyed this method. What about the students who are not that secure and strong in articulating their thoughts in writing? In a campus course you often combine both writing and oral discussion, so the students can compensate for their weaker sides.

To sum it up: Even a distance learning course can be successful, with intensive background work, clear pedagogical ideas, a good team, motivated students and ….