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A Fine Balance

Addressing Usability and Users' Needs in the Development of IT Systems for the Workplace

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Abstract
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IT systems with poor usability are a serious problem in many workplaces. Many workers, particularly office workers, spend a large part of their workday at the computer, and usability problems can cause frustration and impact negatively on productivity. This thesis discusses some of the problems associated with addressing usability and users' needs in IT systems development.

Usability issues and users' needs are often marginalised or even abandoned in systems development. Technical issues and deadlines are given precedence, while usability activities and user activities are cut back or cancelled. Research shows that there are various obstacles to usability and user involvement, including difficulties with understanding the usability concept, insufficient usability expertise and a lack of time and resources.

This thesis presents a number of studies that look at the problem from different angles. The main question is why usability and users' needs are marginalised in bespoke systems development, where IT systems are built for a specific work context. The research presented in this thesis also addresses user-centred systems design as a way of integrating usability issues and users' needs into systems development. The thesis concludes with a discussion about different ways of viewing and representing the users' work: the systems theoretical view and the view of work as a social process. The former emphasises the formal aspects of work and views users as components in an overall system, whereas the latter focuses on work as a social process and people as active agents. The discussion concludes with the argument that the conflict between these two views is played out in the systems development process, which may help explain some of the difficulties that arise when working with usability and users' needs.

Keywords: human-computer interaction, usability, usability professional, usability practitioner, user-centred design, user-centred systems design, IT systems development

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For Bosse, Johannes and Joakim with love

Outline of the thesis

This thesis is comprised of two sections. The first section contains a summary of my research and the papers that are included in the thesis. The second section contains the papers.

The summary

Chapter 1 outlines the problems associated with addressing usability in IT systems development, as well as my research questions and the scope and limitations of my research. I conclude the chapter by describing the contribution this thesis makes to research in human-computer interaction (HCI).

Chapter 2 describes our overall research approach, which is practice-oriented and participatory. I also discuss some problems that are particular to doing research with a practical orientation.

Chapter 3 discusses the HCI area in general and the interdisciplinary nature of HCI research.

Chapter 4 describes the theoretical framework that is the starting point of my research and the reflections presented in this thesis. I briefly summarise two different views of users, work and work practices – the systems theoretical view and a view of work as a social process.

Chapter 5 reviews the studies presented in this thesis. I describe the methods we have used, summarise the results and conclusions of the studies and discuss the validity, reliability and transferability of our results. I also discuss the user-centred systems design approach that forms the basis of our research, including some of the problems associated with this approach.

Chapter 6 wraps up the summary with a discussion and reflection on the research question: why does usability get lost. Here, I contrast the two different views of users, work and work practices that are described in chapter 4. I discuss the conflict and differences between these two views and relate them to the difficulties that arise when addressing usability and users' needs in real-life systems development.

I conclude the summary with a brief overview of the papers and with some ideas pointing towards future research.

List of papers

This thesis contains the papers listed below:

- **Paper I: The Lonesome Cowboy – A Study of the Usability Designer Role in Systems Development**
  Inger Boivie, Jan Gulliksen and Bengt Göransson.
  Publication: Accepted for publication in Interacting with Computers.
- **Paper II: Making a Difference – A Survey of the Usability Profession in Sweden**
  Jan Gulliksen, Inger Boivie, Jenny Persson, Anders Hektor and Lena Herulf.
  Publication: In Hyrskykari, A. (Ed.) Proceedings of NordiCHI 2004, ACM Press, 2004, 207-215.
- **Paper III: Usability Professionals – Current Practices and Future Development**
  Jan Gulliksen, Inger Boivie and Bengt Göransson.
  Publication: Resubmitted to Interacting with Computers, 2005.
- **Paper IV: Key Principles for User-Centred Systems Design**
  Jan Gulliksen, Bengt Göransson, Inger Boivie, Stefan Blomkvist, Jenny Persson and Åsa Cajander.
  Publication: Behaviour & Information Technology, 22 (6), (2003), 397-409. http://www.tandf.co.uk
- **Paper V: Why Usability Gets Lost or Usability in In-house Software Development**
  Inger Boivie, Carl Åborg, Jenny Persson and Mats Löfberg.
  Publication: Interacting with Computers, 15 (4), (2003), 623-639. http://www.sciencedirect.com/
- **Paper VI: Addressing Users' Health Issues in Software Development – An Exploratory Study**
  Inger Boivie, Carl Åborg, Jenny Persson and Stefan Blomkvist.
  Publication: Behaviour & Information Technology, 22 (6), (2003), 411-420. http://www.tandf.co.uk
- **Paper VII: From Piles to Tiles: Designing for Overview and Control in Case Handling Systems**
  Stefan Blomkvist, Inger Boivie, Masood Masoodian and Jenny Persson.
  Publication: Conference Proceedings of OZCHI 2004, Ergonomics Society of Australia, 2004, 161-170.

Reprints were made with permission from publishers where applicable. The papers are referred to as paper I, paper II, etc. in the summary.

About my co-authors

While conducting my research, I have worked with a number of people from different backgrounds and disciplines, which I have found very inspiring and rewarding. From my department, I have worked and written papers together with my supervisor Jan Gulliksen (Professor) and my fellow PhD students; Bengt Göransson, Jenny Persson, Carl Åborg, Stefan Blomkvist, and Åsa Cajander, as well as Masood Masoodian (Department of Computer Science, The University of Waikato, New Zealand) who visited our department as a guest researcher for a brief period of time.

In addition to the people in my department I have also worked together with Mats Löfberg (The Department of Psychology, Karlstad University, Karlstad, Sweden), and Anders Hektor and Lena Herulf (Nita – Swedish IT-User Centre).

Contents

1. Introduction

1.1 The problem

Despite decades of research in human-computer interaction (HCI) and a large number of methods and tools for addressing usability[1], poor usability in IT (Information Technology) systems remains a serious problem. In recent years, usability has received an increasing amount of attention with the growing use of the Internet and software-based consumer products. I believe, however, that usability is equally important in a work context, where inadequate IT systems are a source of frustration to users[2] who are simply trying to do their work.

In my research, I have addressed the issues of usability and users' needs in the development of IT systems for the workplace. Before becoming a Ph.D. student I worked as an IT consultant for more than 10 years, with user documentation, user requirements and usability in real-life systems development. Over the years, I have come across a great variety of work-related IT systems with poor usability. Recently, we interviewed civil servants at a Swedish authority where they showed us their new e-mail system. Simply registering and answering one single e-mail required several steps, including switching between systems, and dragging and dropping the mail into particular folders. This system is supposed to support their work, and make it more efficient, but one of the employees told us that

> "Answering the mail may take half a minute, whereas registering can take like three minutes."
> (Their main task is to answer e-mails, not to register them)

In the workplace, one essential aspect of usability is the fit between organisational goals and work practices[3] on the one hand and the IT systems

[1] Throughout this thesis, I use the ISO 9241-11 (1998) definition of usability:
"Extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use."

[2] I use the term "user" to describe the people who interact directly with the IT system to solve their problems or perform their tasks. They are sometimes referred to as "end user".

[3] I use the term "work practices" to refer to the purposeful and meaningful actions the workers (users) perform – using their knowledge, experience and skills – on a day-to-day basis in order to get their work done.

on the other. The IT systems should "…fit into the fabrics of everyday life" (Beyer & Holtzblatt, 1998, p. 1). The e-mail system described above is an example of poor fit between the users' work practices and the system, since the secondary task (registering the e-mail) was more time-consuming and required more effort than the main task (answering the e-mail). In the literature, there are many examples of how IT systems interfere with rather than support the work practices. Kuhn (1996), for instance, describes some cases where the procedures and constraints imposed by IT systems were in conflict with the work practices. This focus on work practices in relation to usability means that usability is not a simple matter of applying common sense or user interface guidelines – it is primarily about understanding and designing for the users' needs and work practices.

I use the term "users' needs" to describe such aspects that are related to the work practices and routines that the users apply in order to do their work and to meet the organisational goals, with effectiveness, productivity and safety as well as well-being for the individual user. Hence, the users' needs concern their work practices and goals in relation to the *organisational goals* and *business processes*. I am well aware that there are often conflicts between organisational goals and the users' (workers') needs and interests and that these conflicts may be embedded in the IT systems. In practical systems development these conflicts either remain unresolved, or are resolved within the constraints of the project, or outside it. However, I will not focus on such conflicts in my thesis.

Users' needs also include concerns, such as, occupational health issues, job design, job satisfaction, skills utilisation and personal development. Poor usability is directly or indirectly related to a number of occupational health complaints (Boivie, 2003). Repetitive strain injuries (RSI) are a well-known and widespread problem in computer-supported work (e.g. Wigaeus et al., 2001). Stress-related problems are also common, e.g. headaches and sleeping disorders (e.g. Åborg & Billing, 2003). Poor usability is of course not the only risk factor, but it cannot be ignored. Moreover, poor usability is related to or may compound other risk factors, such as high pressure, little control over the work tasks, and monotonous and repetitive tasks.

Introducing a new IT system into the workplace inevitably leads to changes in the organisation, in the roles of the users and in their work practices. The design and contents of the new IT system shape and constrain the work situation and the work practices (Eason, 1997). In many cases, IT development drives job re-design and organisational development rather than the other way round. Clegg et al. (1997) report that changes involving IT systems development are predominantly technology-led at the expense of human and organisational issues "…the technology is considered first and commands most of the resources." (p. 858). Usability and other issues concerning users' needs receive little attention and important aspects in the

future work situation, for instance job satisfaction and occupational health risk factors, are marginalised in the process.

This thesis, and the work it is based on, is an attempt to understand some of the obstacles to designing usable IT systems in the workplace. I am deeply concerned by the way that usability and users' needs are marginalised or even abandoned in real-life systems development projects.

1.2 Research objectives

This thesis is about usability and users' needs in bespoke development that builds IT systems for a specific work context. My main research question has been:

How and why do usability issues and users' needs "get lost", i.e. are marginalised or even abandoned, in IT systems development?

Technical issues and concerns are given precedence over the users' needs. The question is why does this happen? After all, the particular type of development that I have worked with and studied is about building systems for *people* not for technology's own sake. Why then, does technology occupy a privileged position? And, in what ways can the problem be addressed?

In the course of my research, I have broken down my main research question into a number of detailed questions, each of which has added to the knowledge about my main question. These detailed questions are:

- *What happens to usability and users' needs in the development process – why are they marginalised or abandoned?*
- *What do usability practitioners think about usability work in systems development? How do they view their own work situation? What are their views on the difficulties in maintaining a focus on usability?*
- *How can usability and occupational health issues be integrated into systems development? How can the focus on these issues be maintained throughout the development process?*
- *What happens if you introduce a role that specifically addresses usability issues and users' needs in systems development?*

As presented in the papers in this thesis, my research has primarily dealt with why usability and users' needs get lost in the systems development process (papers I, II and V) and also possible ways of addressing the problem (papers III, IV, VI and VII). In this summary, I take the opportunity to compile and further reflect on the findings from the different studies in order to answer the question why usability and users' needs get lost.

1.3 Scope and limitations

This thesis focuses on the development of bespoke systems, i.e. systems intended for professional use in a particular organisation and by particular users. Bespoke systems are typically developed either by in-house development organisations, or in contract development projects.

Bespoke systems development differs from other types of development, for instance the development of consumer products or web applications for use by the general public. Grudin (1991) distinguishes between product development, in-house development and contract development. These three development contexts differ in terms of user focus and user involvement (among other things). I would like to argue that there are differences in the *use* of the systems as well; differences that ought to have an impact on the systems development process. The use of IT systems in the workplace is mainly non-discretionary, i.e. the user has little control over what systems to use, as well as when and how to use them. Moreover, IT systems in the workplace are often used for long hours, every day. The users depend on the systems to get their work done. These matters put the user at a disadvantage as compared to using a web shop or some shrink-wrap product at home. They make the users particularly susceptible to the frustration caused by poor usability, i.e. poor design and inadequate functionality.

Another defining aspect of my research is the focus on administrative work. We study primarily case handling work in large government organisations and other types of administrative work. Moreover, all my research has taken place within Swedish organisations. Naturally, these aspects influence the approaches, methods and models discussed in this thesis. (See The studies section for a more elaborate discussion.)

1.4 Contribution to HCI research

In our research, we have applied user-centred systems design (UCSD), and some of the principles from cooperative design (Greenbaum & Kyng, 1991) *in practice,* in the "real world". Most of our studies have been carried out in real-life systems development projects. The projects have had real-life objectives in terms of constructing systems for use in real work situations (outside the academic sphere). They have been manned by staff from the internal IT departments in our partner organisations, and/or external consultants. The projects have suffered from the constraints and problems that real systems development projects typically suffer from, e.g. tight deadlines, resource constraints and conflicting directives.

We have participated in these projects, but not in terms of providing "extra resources" or holding active roles. The usability people we have interviewed and worked with are practitioners. Our role has been to provide

support on methods and on a personal basis. In one case, one of us participated actively in a series of cooperative design workshops with users. The workshops were, however, organised and led by the usability designer in the project. Moreover, one of my co-authors has worked part-time as a consultant usability designer, and part-time as a researcher (Göransson, 2004).

My focus and my role in this research effort has been to examine the questions of how and why usability issues and users' needs get lost, as described above. My approach has been to try to understand the problems and some of the underlying factors and causes as a way to resolving them, rather than to identify methods for solving them. I believe that concrete solutions must be found in the specific context and adapted to this context by the people who are involved and affected. They must feel that they own the problems as well as the solutions. The outcome of my research is therefore not a new method or model, but rather an understanding and a discussion about some of the factors that lead to the problems discussed above. This discussion may help the reader better understand some of the obstacles to addressing usability and users' needs in a particular development project or organisation.

Systems development is a complex social[4] process, i.e. a joint activity with the aim to achieve goals, based on social and cultural practices. These individual, social and cultural practices vary depending on the context or setting. The findings and discussion in this thesis must therefore be interpreted in the light of the settings in which we have conducted our research. Nevertheless, I believe that the outcome of my research may be transferred to, and applied in similar settings. However, it is up to the reader to judge the usefulness of the insights discussed below, in the context of his/her own particular setting.

[4] I use "social" to refer to communication, coordination and interaction between individuals in a group. Hence, I do not use social to refer to relations on a societal level (see Nygaard, 1986, for a contrasting view).

2. Research approach

2.1 Participation and action in practice

The research presented in this thesis is part of a larger research effort undertaken by the research group[5] to which I belong. The main objective has been to understand and solve problems in real-life systems development. Our research is what Markus (1997) refers to as "practical research", emphasising "...disciplined empirical observations and ordinary knowledge about why things happen. Practical research honors concrete details, commonsense observations and practitioners' rationales" (p. 23).

I have both personal and practical experience with the issues that my research questions deal with. In my previous work as a usability practitioner I encountered the obstacles and difficulties described by the informants in our studies as well as in HCI literature (e.g. Wilson, et al., 1996 and 1997; Rosenbaum, et al., 2000; Gunther, et al., 2001). I have felt frustrated working in projects where usability issues and users' needs received little attention. But I have also felt the satisfaction of finding good solutions to design problems together with users and developers. The practice-oriented focus of our research has therefore been very important to me.

Action research provides a way to intervene in and study systems development in practice. This research approach combines research and action to bring about change and improvement in some community or organisation (Hopkins, 1993). The studies described in this thesis are all part of an action research effort on usability and user-centred systems design (UCSD) that has been running for more than 10 years at our department. The research comprises a number of parallel studies as well as subsequent studies of the systems development process. Among other things, we have studied two specific organisations over an extended period of time. We have observed the development processes in these organisations, and suggested changes and activities to effect those changes; we have also participated in the activities and observed the outcome. We have also conducted shorter studies in other organisations. The papers in this thesis describe different studies and aspects of this ongoing research effort.

[5] The research group comprises some 10 senior researchers and Ph.D. students.

Action research means that the researcher *participates* in the community or organisation.

> "The world is seen not as a collection of independent objects, but as a collection of integrated, interactive, self-consistent and creative relationships of actors. The researcher is supposed to involve the subjects of the research as co-inquirers. Research is conducted *with* people rather than *on* them. (Rasmussen, 2004, p. 22)

Our research approach may be described as participatory action research where "…some of the people in the organization or community under study participate actively with the professional researcher throughout the research process…." (Whyte et al., 1991, p. 20). We have worked with usability practitioners, systems developers and human resource people, as well as with management representatives in our partner organisations, setting up projects, initiating actions and analysing the outcome. The practitioners in these organisations have worked parallel to us, codifying the knowledge produced into e.g. role descriptions and process descriptions that have been used in their development projects, generating a kind of "local theory" (Elden & Levin, 1991). Our role has been to facilitate and support the processes of change, but the main body of work has been carried out by the people within these organisations (for further details, see papers I, IV and V in this thesis, and Göransson, et al., 2003; Gulliksen & Göransson, 2001).

The main aim has been to redesign the systems development processes and practices in our partner organisations in order to improve usability and the users' work situation. This approach to action research is related to the organisation tradition described in (Lau, 1997), which focuses on "… effective design and development of organizations." (p. 40). Our focus has been on improving usability and the effectiveness of the systems development process, rather than on advancing the cause of the users as an under-privileged group.

Action research is conducted in cycles, each of which comprises a number of activities: identifying problems and actions, initiating and carrying out the action, and observing and reflecting on the outcome of the action. Walton and Gaffney (1991) suggest another stage for deepening, institutionalising and disseminating the changes. In our research, we have seen that actions and changes in an organisation will not only spread in widening circles within that organisation but into other organisations as well. When moving to other projects and organisations, we re-use our research strategies on some levels, but we also modify them and develop new ones. This is particularly apparent when we are now starting new projects in new organisations. The outcome of our previous research projects provides a background and input for these upcoming projects, generating new and refined knowledge.

However, there are problems in action research – for instance, the principles of scientific quality and rigour versus the practical relevance and constraints that may arise in a real-life situation (Elden & Levin, 1991). Action research requires long-term commitment and investments from the researchers as well as from the practitioners and their organisation(s). The scientific rigour and the extra effort this may require from the participants in an action research project are not top priority for the practitioners. Moreover, action research is particularly susceptible to changes in the organisation. For instance, we have had problems with (pilot) development projects that have undergone major changes or have been cancelled, thus jeopardising the evaluation of the actions introduced by us. In such cases, we have had to make do with the findings that we were are able to get in the course of the project.

2.2 Knowledge production in practice-oriented research

A practice-oriented focus places certain demands on the production and dissemination of knowledge in the research process. Gibbons et al. (1994) discuss knowledge production in terms of two modes. Mode 1 represents traditional, disciplinary research and Mode 2 represents a new way of producing knowledge which has moved out of the academic world. Mode 1 is primarily concerned with identifying "first principles" or universal laws, and scientific quality is defined and upheld within the discipline, by peer review. Mode 2 is focused on solving practical problems – it is carried out within a specific period of time and takes place in a particular setting. The knowledge that is produced is particular to the situation and setting. Quality is controlled not only by mechanisms "within science", but also by the practical usefulness of the outcome of the research effort.

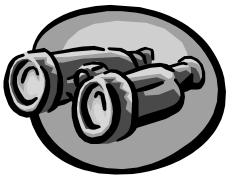
In our research, the problems we try to solve are on one level common to different settings, e.g. the lack of usability focus in different organisations or projects. Nevertheless, the problems and solutions are local – they are particular to the setting and the situation at hand. Each new research project (or sub-project) comprises a unique setup of people, relations, problems, etc. The theories, approaches and methods we use are therefore "locally driven and locally constituted" (Gibbons et al.,1994, p. 29). This does not mean that practice-oriented research should be eclectic, using an "anything goes" approach. But in order to solve practical problems we use theory, knowledge and methods that best suit the situation as it evolves.

Since our research is practice-oriented, it is important that the knowledge produced is applicable and useful in real-life situations. This means that the criteria for judging the quality of our research are partly defined by stakeholders outside academia, in our case usability practitioners, systems developers, project managers, etc. Having practitioners judging the applica-

bility and usefulness of research outcomes means that the "knowledge that counts" must be re-defined in the research project in order to include their knowledge as well. Gibbons, et al. argue that Mode 2 knowledge production "…includes a wider […] heterogeneous set of practitioners" (p. 3). This brings us back to the participatory action research approach described above, where the knowledge of the practitioners is an important factor – for instance their knowledge of what constraints circumscribe usability work and user involvement in real-life systems development. The actions and methods we suggest for addressing usability issues and users' needs must be adapted to constraints such as deadlines, project phases and deliverables, as well as technological limitations and possibilities.

3. My research on the HCI map

3.1 My view of HCI



In my opinion, human-computer interaction (HCI) is not a particularly well-defined concept or research area. It is, of course, what its name implies – the interaction between human beings and computers, including interaction and communication between people mediated by computers in all their forms. However HCI is also an area of research that explores human-computer interaction. There have been many attempts to define the research area or discipline (e.g. Long & Dowell, 1989). In this thesis, I base my discussion on the definition suggested by ACM SIGCHI (Association of Computing Machinery, Special Interest Group on Computer-Human Interaction):

> "Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them"
> (ACM SIGCHI, 1992, section 2.1.)

According to ACM, HCI is about studying the way people interact with computers and all issues pertaining to that interaction. The four areas making up the cornerstones of HCI are: the use and context of computers, human characteristics, the computer systems and interface architecture, and the development process. In recent years the use of computers (in all their forms) has moved outside the traditional office setting, increasing the complexity and diversity of human-computer interaction. Nevertheless, the ACM definition and description of HCI is valid for my purposes. In this thesis, I focus on the process of developing computer or IT systems[6].

A workshop at the HCI'91 conference (Diaper & Addison, 1992) identified three main categories of problems within HCI. The categories were: problems concerned with the basic nature of HCI, the application of HCI in systems development, and the education and marketing of HCI. Our

[6] I use the term IT system quite loosely to denote a piece of software, possibly combined with some specific hardware, that provides support for particular, related tasks, for instance, a case handling system or a sales support system. My research is only concerned with interactive systems, and not with embedded systems.

research concerns the second category – how to apply HCI knowledge and expertise in systems development, in order to improve the usability of the resulting systems.

My personal interpretation and application of the HCI concept is that it is about addressing human and social[7] aspects in the design, development and use of IT, in order to make the technology suitable for the users and their needs.

3.2 Integrating different disciplines

One of its strengths, but perhaps also one of the weaknesses of HCI, is its multidisciplinary or interdisciplinary nature. The researchers in our research group have backgrounds in computer science, occupational health, behavioural science and organisational psychology and human resource management. My own background is an MSc in Engineering Physics, and a number of years as an IT consultant. Below, I briefly discuss some aspects of multi-/interdisciplinarity in relation to our research.

Multidisciplinary research involves people from different disciplines, cooperating to reach a common goal, but remaining within the limits of their separate disciplines. The research problem is (in one sense) common to the researchers, but they study it by applying theories and methods from their separate disciplines, and there is little integration. The results are the "sum" of the products from the separate disciplines, even though multidisciplinary research opens up for alternative ways of interpreting these products. *Interdisciplinary* research involves a higher level of integration. No one single discipline can account for the problem at hand and the researchers must move outside the limits of their own disciplines by integrating aspects, theories and methods, at least to some extent. (Sandström, 2003).

The reason for involving different disciplines is, of course, that the research problem requires such an approach. Hillbur (2004) argues that interdisciplinary research typically attempts to solve real-life problems – in our case, problems in real-life systems development. Our research has therefore involved looking at the development process from several different viewpoints: as a social process based on the participants' practices, communication, interaction and attitudes (papers I-V; Öhman Persson, 2004) as a process of change affecting the users situation and their well-being (papers VI and VII; Åborg & Billing, 2003; Åborg, 2002), as a design process (papers III and IV; Göransson, 2004) and finally as an engineering-oriented construction process (Göransson, et al., 2003).

[7] I use "social" to refer to communication, coordination and interaction between individuals in a group.

In our projects, each participant has contributed with expertise and skills from his/her own area. We have used theories and methods from a variety of disciplines, integrating them to some extent, primarily on a practical level. We have also cooperated in analysing and writing up the results of the research. For example, in the project described in paper VI we used the Karasek-Theorell model for stress-related complaints (Karasek & Theorell, 1990) from the occupational health discipline, in combination with contextual interviews and the work models suggested in Contextual Design (Beyer & Holtzblatt, 1998).

Herrman (2004) argues that alternative perspectives of a particular problem (in Herrman's case, the concept of pain) should not be seen as exclusive. Looking at pain from a psychological or sociological point of view does not mean that the medical perspective and treatments should be abandoned. I agree with this view, since our research problem cannot be accounted for by a single viewpoint or perspective. For instance, solving real-life problems in systems development requires that one understands it as a social process, while at the same time acknowledging its roots in software engineering. Systems development is primarily perceived and described as an engineering process; therefore solutions that do not take this into account would probably be impractical in real-life development projects.

3.3 Difficulties in interdisciplinary research

Involving participants, theories and approaches from different disciplines adds complexity to the research process and I discuss some of the difficulties below.

As described above, the researchers in my group come from different disciplines based on different research traditions. Software engineering, cognitive psychology and occupational health have their roots in a research tradition that emphasises objectivity, accuracy and precise measurements. On the other hand, looking at systems development as a social process requires interpretive, qualitative approaches based on a research tradition that emphasises people's subjective understanding of the "social world" and the presence and reflections of the researcher.

Bannon (1992) discusses the problems with merging different disciplines and frameworks – does this approach produce truly interdisciplinary research or does it simply open up a new arena (HCI in our case, or in Bannon's case Computer-Supported Cooperative Work[8], CSCW) for people from different disciplines to carry on their research "as usual". Bannon argues that merging

[8] Computer-Supported Cooperative Work, CSCW, is an area of research which is closely related to HCI. It studies how computers are used in cooperative work e.g. from sociological, psychological, and technological viewpoints.

the different disciplines, theories and frameworks into one single framework is virtually impossible. I am inclined to agree with this conclusion. On the other hand, our studies have required that we integrate theories and methods to some degree.

Fog (2004) suggests that one of the problems is that the interdisciplinary project often focuses on how to do research, but fails to address the underlying assumptions about what reality is – and therefore what the object of study is, and what we can know about it. This does not mean that different views of the world can be merged into one single view, but reflecting on the underlying assumptions of the different disciplines facilitates integration on a methodological and practical level. In our case, this has primarily included discussions about the issue of "borrowing" methods from other disciplines and adapting them to our research problem, without losing or compromising their grounding in theory and conceptual frameworks. We have also discussed the differences between a view of the social world that acknowledges different interpretations that may be equally valid, and a view of the world that presumes an objective truth as expressed in general laws.

To me, these discussions have entailed a fascinating "journey". I have an engineering background, but my research problem is not an engineering problem. This has necessitated that I move from one discipline to another, changing the way I think about research, knowledge and the world at large. I discuss this "journey" further in the Reflections section.

4. Theoretical framework

4.1 Usability in a work context

As described above, this thesis is about addressing usability issues and users' needs in the development of IT systems for the workplace – specifically administrative work.

The ISO 9241-11 (1998) definition of usability emphasises the effectiveness and efficiency of the use of IT. This definition moves beyond the "surface" characteristics of an IT system – e.g. ease-of-use and ease-of-learning – and points to the *utility* or *usefulness* of IT systems. An IT system must contain functionality and services that help the users perform their tasks and solve their problems so that they can do their work. In the workplace, one essential aspect of usability is therefore the fit between work practices (in relation to organisational goals) on the one hand and the IT systems on the other hand. It is therefore essential to understand the users' current work practices, and how these practices may be affected and improved by new technology. In this section I will discuss different ways of viewing the users' work and work practices – i.e. different ways of viewing human activity – and their implication for our research.

The two perspectives[9] that I focus on are the systems theoretical perspective and a perspective that views work or human activity as a social process. I have chosen these two perspectives for two reasons: a) the systems theoretical perspective influences the way in which IT systems are seen and developed in the contexts that we have studied, and b) the view of work as social a process provides an alternative way of viewing the use of IT systems in the workplace. Furthermore, the view of work as a social process is a

[9] I use the word perspective in the sense of "a way of regarding situations or topics etc.". A perspective is based on implicit as well as explicit assumptions about "…the relationship of aspects of a subject to each other and to a whole" (www.dictionary.com)
A theory is "A set of statements or principles devised to explain a […] phenomena" (www.dictionary.com). It explains the type and essential characteristics of the phenomenon, the relations between factors and how they may be explained. A theory typically consists of concepts, structural patterns and/or regularities, explanations and possibly models and how to apply them (Wallén, 1993). A theory can be descriptive, explanatory, prescriptive/normative and/or predictive.
A model is a simplified and schematic description of the essential relations between different concepts, properties and components of the phenomenon (Wallén, 1993).

defining aspect of the cooperative design approach (Greenbaum & Kyng, 1991), which is an important component in our research.

4.2 The systems theoretical perspective of IT use and work

The systems theoretical (ST) perspective places the emphasis on the technical and the formal aspects of the relationship between man and machine (Nurminen, 1987) – for instance, how individual users enter or modify data in a database in accordance with rules and procedures. Kammersgaard (1990) discusses along similar lines when describing the systems perspective of IT use. In this perspective, the technological and the human are seen as components of the same system, with basically the same properties. Interaction is seen as the transmission of data, and work is described from a data processing point of view where the tasks of the users are seen as sets of pre-defined operations. The ST/systems perspective focuses on the technology, and human beings are seen as extensions of the machine and/or as belonging to the environment.

The engineering approach to problem solving (including systems development) focuses on the technology and is closely related to the ST/systems perspective. Engineering-oriented problem solving goes back to Descartes' model for doing research (Gedenryd, 1998). In his Discourse on the Method of Rightly Conducting the Reason (excerpt in Mark-Wogau, 1998), Descartes designates mathematics as the model science, in that mathematics is based on a stable foundation and a clear and unequivocal reasoning. Only by applying that kind of reasoning can the scientist arrive at true knowledge about the world. Descartes argues that in order to arrive at the truth, i.e. to solve a problem, the scientist must first break down the problem into a number of sub-problems, each of which is definable, delineable and solvable, and then combine these solutions so as to arrive at the answer to the entire problem. According to Descartes, everything, from the entire universe to the smallest component of life can be described and explained by means of this analysis-synthesis approach. However, it requires reduction and simplification of the problem. One has to limit oneself to the relations and proportions within the phenomenon. These relations and proportions can furthermore be singled out and studied one by one or in sub-groups.

Engineering-oriented problem solving is therefore about defining delineable problems that can be described and solved by means of rules (mathematical models) or by applying a number of pre-defined steps. The problem requires transformation into a set of parameters that can be defined in advance – i.e. a "tame" or "benign" problem (Rittel & Webber, 1973). A

tame problem is characterised by an exhaustive problem formulation that can be stated in advance and a "stopping rule" clearly stating when the problem is solved (among other things).

Gedenryd (1998) discusses how this approach to problem-solving is played out in the design process, which is described and perceived as a sequential process of analysis-synthesis-evaluation. This approach is of course applied not only to the design process, but also to the design problem as such. Fällman (2003) points out that

> "… the conservative [my note: engineering-oriented] account assumes that there is a 'problem' to be solved, and that descriptions of this problem can be comprehensively and accurately produced, if possible in the form of a structured requirements specification…" (p. 226)

In systems development, the design problem is a social process or situation – for instance the work practices and goals of the users in a workplace or an organisation. However, the organisation and work practices are seen primarily as information flows, transactions, database records, objects, etc (Nygaard, 1986). The design problem is described by means of formal representations that state explicitly the properties and relations of all the objects that are to be embodied in the IT system (Winograd & Flores, 1986). The work practices and goals ("task environment") are often described by means of graphic models[10]: actor models, use case models, class diagrams, etc. (e.g. Jacobson, et al., 1999).

One example is Usage-Centered Design (Constantine & Lockwood, 1999) where the work practices and goals of the users are described by means of essential use cases. These are step-wise descriptions of the user-system interaction that contains user intentions on the one side, and system responses on the other. The language used is succinct, leaving out details and contextual information. Table 1 shows the essential use case for getting cash from an automatic teller. Each task that will be supported by the system is described in a similar way, and the use cases are compiled into a model showing relations between the different use cases. Users are described by role models where a role is "…an abstract collection of needs, interests, expectations, behaviors, and responsibilities characterizing a relationship between a class or kind of users and a system" (Constantine & Lockwood, 1999, p. 79).

In Usage-Centered Design, the emphasis is on abstract roles enacting use cases with a technical system, and not on the human being interacting in a complex social situation that includes interaction and communication with other people.

[10] In systems development, a model is typically graphic, describing concepts/objects and their properties and relations by means of e.g. boxes, lines and arrows.

Table 1. *Withdrawing cash from an automatic teller, described as an essential use case (adapted from Constantine & Lockwood, 1999, p. 105).*

User	System
identify self	
	verify identity
	offer choices
Choose	
	dispense cash
take cash	

Thus, in the engineering-oriented perspective, users (people) are primarily defined by their relation to the technical system. Their tasks, goals and needs are described as sets of steps and rules defining the interaction between the user and the system. This way of viewing people and their actions is similar to the ST perspective, where people are seen as extensions of the system, interacting with it, but not through it. Communication and interaction between people are obscured (Nurminen, 1987). In this perspective, work in itself is seen as sets of pre-defined operations making up the tasks and work practices in a "building-block" fashion.

This way of understanding phenomena in the world as well-defined problems, described by sets of characteristics or parameters is sometimes referred to as "boxology"[11]. Modelling approaches in systems development are examples of the boxology approach. The models capture certain aspects of the users' needs and work practices, but obscure others.

One may argue that the ST perspective has become irrelevant, having been replaced by other perspectives, e.g. the socio-technical (SoT) perspective that addresses some of the issues including the lack of focus on people. But there is evidence in literature (e.g. Clegg, et al., 1997; Hasu & Engeström, 2000) that the technology focus is still strong in systems development. This focus on technology was also played out in one of the projects that we have studied (papers IV and V).

4.3 Work as a social process

The SoT perspective distinguishes between the technical system and the social system, focusing on the relationship between the two. Human beings are seen as active users of IT, and their practices and needs must be addressed in the development of technology (Nurminen, 1987). This requires a focus on human activity and its nature.

[11] "Boxology" applies to approaches that describe a phenomenon in the world as consisting of well-defined boxes with limited interaction, summing up those characteristics of the phenomenon that are of interest. See for instance Senger (1998).

Human activity, e.g. work, is a *social* process, a joint activity based on communication and interaction between human beings. Human activity is purposeful, i.e. driven by goals or intentions. People participate in the process to achieve goals on different levels. Clark (1996) describes four goal levels: a domain or main goal for the activity, procedural goals, interpersonal goals, and private agendas and intentions. In a workplace, there are main goals that concern the outcome of the business/organisational processes – for instance, making decisions regarding insurance claims or tax return claims. Procedural goals may concern the effectiveness, efficiency and security when processing claims. There may be interpersonal goals regarding the way people interact and help one another with complex claims. And, finally, personal intentions may concern promotion or having a position where one feels, safe, comfortable and capable[12].

The social reality of any group is constructed through the interchange between the members of the group (Fishman, 1999). We "create" our social reality when interacting and communicating with one another as well as when orienting ourselves in that social reality. Our understanding of the world is subjective and intersubjective[13], in that we understand the external world through our pre-conceptions, and through our culture. Fishman argues that our perception of the world is constructed within the constraints of a historical and cultural context, i.e. an interpretation of the social world must make sense to the people participating in it. So, in a sense there is an agreed-upon "truth", though it is not an objective one.

We can only understand, think about and describe the world through the concepts that we have at our disposal. These concepts are social constructions, shaped and formed by our culture. This means that not only our social reality, but also what we think as individuals, i.e. cognition, is socially determined (Luria,1976; Resnick, 1991).

This means that the "social reality" in a work situation is constructed through the interaction and communication between the people involved. It is based on their subjective and intersubjective understanding of the situation, within its cultural and historical context. Work is specific to the context and shaped by the circumstances of the situation as it evolves – i.e. it is situated and contextual. This means that work practices cannot be pre-defined; they emerge in the evolving situation and are constantly generated, shaped and adapted to it. This view of work contrasts with the systems theoretical view of work described above.

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[12] I base my reasoning and work on the assumption that in general, people want and try to meet the goals on these different levels to the best of their ability. There are mechanisms counteracting this in certain situations, for instance, social loafing in teamwork, but I will not discuss such mechanisms in my thesis.

[13] Subjective here refers to our individual understanding of the world surrounding us, both the social and the physical world. Intersubjective refers to such understanding that we are capable of sharing or holding in common.

In the following sections, I will briefly discuss some aspects of work as a social process which I believe are particularly important in the process of developing IT systems for use in a work context. This discussion includes the following questions; what does it mean that activity is situated and contextual, and what is the role of language and communication in this social process.

4.3.1 Work as situated action

Work and work practices are *situated*, i.e. they depend on and are shaped by features and circumstances in the situation (Suchman, 1987).

Suchman argues that an action cannot be predicted from the goals, nor can an action be inferred from its outcome, since many different actions may meet the same goal and produce the same outcome. Actions are shaped by the evolving situation, where an action must be seen and interpreted in the light of the actions preceding it – but where no action fully determines what action will come next. Features and circumstances in the situation and social structures or "facts" that are perceived as given in the situation are *resources* which the participants in an activity use to produce purposeful and meaningful actions. These resources shape and influence the action but do not prescribe it. Intentions are also resources that shape the action, in that they narrow down the range of actions that are meaningful in the situation, they keep the action "on track". But intentions cannot fully prescribe or predict action.

Applied in a work situation, this means that the actions the workers perform, i.e. their work practices, are particular to the evolving situation. Rules and regulations, official procedure, the physical and social setup of the workplace (e.g. how this allows for communication and interaction between people), etc, are all part of the situation, functioning as resources which the workers use to achieve goals. In administrative work – for instance, case handling in authorities, there are strict regulations and procedures for the processing of a case. They describe what steps are necessary and in what order they should be taken and what information is required for making a decision, etc. The civil servants use these regulations and procedures as resources in their work in order to achieve goals on the different levels (Clark, 1996). But their work practices cannot be fully predicted or prescribed by the regulations and procedures. Sachs (1995) describes this as an activity-oriented view of work as opposed to the explicit view of work that is represented in official documents and procedures describing work as "…sets of defined tasks and operations … which fulfill a set of business functions" (p. 36).

When running smoothly, action is basically transparent to us. We just act. Only when there is some kind of breakdown do we need to reason about our action, and to describe it in terms of plans and sequences of operations.

However, Suchman argues that the "goal" is very often not clear to us until we have actually reached it. Keller and Keller (1996) argue furthermore, that what one has to know in order to act appropriately in a specific situation is only fully known at the closure of the situation. Knowledge and action evolve in a cycle as the activity proceeds, based on the circumstances and resources in the situation.

Situated work practices cannot be predicted or inferred from the goals and outcome of the work activity. This means that what people do at work in order to meet the business goals, as well as other types of goals, cannot be completely pre-defined and prescribed. The actions taken by a civil servant processing a tax return claim are a result of the particularities in the situation. All work activity must accommodate the particularities of the situation and the action that evolves as a response to these particularities (Harris & Henderson, 1999). Hence, IT systems that support the work activity must allow for these particularities, and the situated and improvisational nature of the work practices. They must contain flexible support and services that the users can use as resources in their work.

4.3.2 Context

What constitutes the situation or context in which activity and action is embedded? ISO/IS 13407 (1999) defines context of use as

> "users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used" (p. 2)

This definition implies that context is more than a physical and social setting in which people act, in that the actors (users) themselves and their tasks are part of the context.

Dourish (2004) argues that the view (often held in systems development) of context as some kind of "container" or a fixed setting in which activity takes place, is mistaken. In this view, context is made up of delineable sets of stable features that can be captured and represented – for instance, in models (compare the ST perspective and boxology approach described above). Instead, Dourish argues that context is a result of the activity in itself; that context "…is actively produced, maintained and enacted in the course of the activity at hand" (p. 22). I take this to mean that human activity is contextual in that it produces and maintains context, rather than taking place *within* a context (container). At the same time, the context shapes the activity; context and activity are mutually constitutive.

Hence, in a workplace, context is not made up of some stable set of characteristics of the users and their tasks, the organisation and/or the physical location. Instead, it is the result of an ongoing process of people's activity. People create the context as they go, using features and

circumstances in the situation as resources in the process. In this view, it becomes important to explore these resources and how people make use of them.

There are various theories for exploring the relationship between action and context that focus on different aspects and factors in the context and different levels of context. The conception of context and action described above has been criticised for focusing on the "here and now", obscuring the material, historical and cultural world in which action emerges (Lave, 1996). Wertsch (1991) describes situatedness on two levels – that of the interaction in the small, limited group and that which belongs to the "bigger picture", for instance, social institutional and cultural settings. Wertsch argues that these two levels need to be merged to some extent and terms this approach the socio-cultural approach.

For my purposes, the important contribution of these theories is that they focus on the relations and interaction between persons acting and the context. They emphasise the complex and improvisational nature of work, where work practices are shaped by particularities in the immediate situation as well as in the cultural and historical context. For instance, the actions taken by a civil servant in processing a tax return claim are shaped by the information available to him/her at the moment, by the legislation and rules regulating that type of claim, and the praxis that has evolved over the years for processing such claims, as well as the historical and legal context of the Swedish civil service. Furthermore, there is the immediate situation – the "client"[14] may be on the telephone and upset about the time it takes for the claim to be processed, or there may be other clients/claims that need to be addressed parallel to this particular claim, or a colleague may walk into the room and ask for help or support.

The question then becomes how people relate to features and circumstances in the situation that have an impact on the process in that they shape the activity and context? And also what knowledge and pre-conceptions people bring to bear on their activity and how this is done?

4.3.3 Communication and common ground

Dourish (2004) argues that what people bring to bear in their interactions is their "…everyday, cultural, common-sense understandings of the nature of the social world." (p. 22). But, he notes, this understanding needs to be *mutual* between the people involved. How do people arrive at a mutual understanding? Clark (1996) suggests that communication and interaction are based on common ground.

[14] In the Swedish civil service, citizens are often referred to as "clients" in their dealings with the authorities.

> "Everything we do is rooted in information we have about our surroundings, activities, perceptions, emotions, plans, interests. Everything we do jointly with others is also rooted in this information, but only in that part we think they share with us" (p. 92).

We act on our individual beliefs or assumptions about what constitutes our common ground. If we are mistaken about the contents of our common ground, we may or may not discover this mistake. But there is no "objective truth" about the contents of our common ground; it is our individual *beliefs* that count.

Common ground is based on assumptions and beliefs that we have about communication and about the world. Conversational conventions include our basic assumptions about communication in general, and the behaviour we display in communication, for instance, that we make it clear to the other participants when we do not understand. There is also a communal ground based on the experience we have from relevant communities, for instance, a shared educational background (e.g. programmers), and a shared (social) language. And there is also personal common ground, which is based on the joint history of interaction, as well as the emergent interaction of the people involved.

Hence, in any human activity we utilise our common ground in interacting and communicating with one another. We relate to the world by referring to it and pointing to it – we "wave our hand at it" – to the extent that we have established common ground about the objects and concepts that are relevant to the interaction.

Furthermore, Clark describes a process of grounding in which we continuously assess the contents and strength of the common ground, by aligning and re-aligning the things we say, based on how the other participants interpret what we say (our interpretation of their interpretation). Suchman argues that conversation is "ensemble work" (1987), where the listener takes an active part in the process of producing a mutual understanding of what is being said and done. Conversation – and communication in general – is far more than a simple process of speaker stimulus and listener response. Conversation is a collaborative process where "…who talks and what gets talked about, is decided then and there, by the participants in the conversation" (Suchman, 1987, p. 73). Hence, access to "the floor" (turn-taking) is an important factor in conversation in that it provides control over the agenda.

Communication may be formalised in regards to both turn-taking and agenda, in accordance with either explicit conventions and regulations (e.g. courtroom) or implicit expectations and conventions (e.g. a physician questioning a patient). In such communication, one party is often considered to be an expert of some kind and as such controls the turn-taking and agenda.

In contrast to this view of communication, the ST perspective focuses on communication between the user and the technical system. This human-machine communication is seen as data transmission in accordance with pre-defined rules. Communication between people – for instance, a user reading and using data that has been entered by another user – is obscured in this perspective (Nurminen, 1987).

4.3.4 Language

Language is central to communication and to interaction, and for achieving goals in a social process. It is central to our understanding of the world, and it is the vehicle that we use to create meaning and our reality (Winograd & Flores, 1986). We use language (categorisation) for creating social order and for understanding ourselves and others (Suchman, 1994).

Language is primarily social and situated. We use and give meanings to words and utterances in relation to the situations and communities in which we participate. We use "social languages" (Wertsch, 1991). A social language is "… a way of speaking that is characteristic of a particular group in a particular sociocultural setting" (p. 95) – for instance, professional jargon and the language used in a workplace or in the riding stable. We always use social language. We cannot say things that are independent of the activity that we participate in, of the people we communicate with, or of the group or community we belong to and participate in. The social language shapes what we can say, as well as what we think. Whenever we communicate we invoke a social language, and therefore also a particular socio-cultural context.

Language shapes and constrains world views (Resnick, 1991). We can only think about the world in ways that language allows for. This means, that in order to understand and participate in an activity, we need language to talk and think about it. Words give us the basic units with which we can reflect on the world; and along with words come the history and culture of the communities and groups we belong to.

Luria (1976) discusses the relationship between language and thought, arguing that what we (can) think depends on what types of activities dominate in the socio-cultural group that we belong to. These activities shape the concepts and categories that we need in order to orient ourselves in our everyday lives. In a series of experiments, Luria showed how people classify colours, geometrical figures and objects in accordance with their cultural and socio-economic background. Categories that were meaningless to the respondents in their way of life were basically rejected as irrelevant. For instance, illiterate people would group a saw, a hammer, a hatchet and a log (piece of wood) together, arguing that they all belonged to a particular situation of use (situational thinking). They would reject the "tool" concept as irrelevant, since grouping saw-hammer-hatchet together and excluding the

log made little sense in their way of life. Whereas people with a modicum of education had little difficulty in grouping objects in accordance with "theoretical" concepts, such as "tools", "animals" and "plants".

Luria based his argument on the assumption that new ways of doing things – i.e. changes in the socio-historical structures and social practices – create new mental processes and radically alter the way we think. An example of this is the shift from situational thinking to conceptual thinking described above. It has been argued that the change is not so dramatic. For instance, Cole (1976) argues that new ways of acting result in new ways of applying existing mental processes and knowledge, rather than radically restructuring them.

Cole's viewpoint is applicable in the changes following on the introduction of a new IT system in a workplace. Many IT systems entail new work practices. However, the way the workers think about their work and its products must be related in some way to how they thought before the change. They cannot think about their work in radically new ways, separated from the old ways of thinking, since that would effectively destroy the continuity and meaning of their work, making the transition difficult and even impossible. Beyer and Holtzblatt (1998) argue that good design (of IT systems) changes the way people work just to the extent that it becomes more efficient, but not so much that people cannot make the transition.

Luria conducted his research on ethnic groups, but the same thought-shaping mechanisms exist in any community or group. We all belong to a large number of communities and groups, on a national, local and family level. All these communities and groups have their own social languages, shaping the way we think, talk and act in a particular situation.

Hence, in this view knowledge, language and action are all situated, i.e. particular to the situation and respond to and are shaped by circumstances in it. In contrast, the notion of knowledge is objectivistic in the ST perspective (Nurminen, 1987). In this perspective, knowledge can be separated from the context (situation), as well as the "knower". Consequently, it can be stored as data in e.g. databases.

4.4 Understanding work practices – user-developer communication

I began this section by arguing that usability in the workplace is about the fit between the work practices on the one hand and the IT systems on the other. I have also described different ways of viewing work.

In the ST perspective, or engineering-oriented approach, users (people) are defined in terms of their relationship to the technical system. People are seen as extensions of the system, interacting with it, but not through it.

Communication and interaction between people are obscured. Their tasks, goals and needs are described as sets of operations and rules defining the interaction between the user and the technical system. Work in itself becomes a process where people carry out pre-defined operations making up the tasks and work-practices in a "building-block" fashion (boxology).

In the SoT perspective, human activity is seen as qualitatively different from the functioning of the technical system. I have argued that work (i.e. human activity) is a social process which is situated and contextual, i.e. particular to the circumstances of the situation. Language plays a central role in that it is our primary tool for understanding the world and for interacting and communicating. Furthermore, language is particular to situations and communities; it is social in its use and in its origin.

From a systems development point of view the differences between the two views on work are played out in the methods and approaches used for learning about and understanding the work practices of the users, i.e. the design problem.

Engineering-oriented systems development is often based on models as described above. In the organisations we have studied, user representatives are often invited to modelling sessions, and/or expected to review and "sign off" the models, so that they can then be used as input in the development process. The user representatives are often brought into the projects for extended periods of time, on a part-time or full-time basis (paper V). Since in any given situation people orient themselves to the conventions and social language used in that situation, this means that the user representatives in a development project adapt to and adopt the way systems developers speak about their (the users') problems and needs, e.g. as use cases and requirements (paper V). Also when graphic displays (e.g. models) are used to support communication, these are primarily rooted in the developers' social language, using concepts, techniques and tools that are meaningful to the developers (Nygaard, 1986). Hence, in user-developer communication, the developers are familiar with the notations and conventions for the "conversation", which gives them an advantage in the "floor-taking process" controlling what is being said by whom.

A shared understanding of a particular model does not necessarily mean that there is a shared understanding of the *work practices* that are described in that model. The model shapes and constrains the way users and developers can talk about and understand the work practices – particularly since the models used in systems development often reflect the view of work as sets of pre-defined operations while obscuring other aspects. In other words, the models represent the explicit view of work (Sachs, 1995). Moreover, the users' and developers' common ground is by necessity limited in that they do not share background and experience; in particular they do not share the knowledge, background and experience of the work situation being described. This means that the model effectively limits the shared

understanding of the work practices to what the users perceive the model allows them to express and to how the systems developers understand the relevance of that information.

Clark & Brennan (1991) point to some mistakes in communication that may further reduce the relevance of what the systems developers understand the users' needs to be. One such example is people's tendency to produce incomplete statements and have the conversation partner fill in missing information. In user-developer communication about the users' work practices, the developers have to "fill in the gaps" based on their own pre-conceptions and assumptions, which are typically far removed from the everyday work of the users.

Furthermore, Hatano and Inagaki (1991) discuss the role of partisanship in communication – i.e. that the individual participants tend to favour a particular view or standpoint. Group interaction involves a certain amount of partisanship, such as the formation of sub-groups that each argue for a particular viewpoint. In user-developer communication, the developers may support the description of the users' work practices that best fit their (the developers') purpose (encoding parts of it in the computer) or their pre-conceptions. They may form sub-groups together with particular users, against other users. In a group interaction where no authoritative right answer is to be found, the outcome depends heavily on the direction of the argument.

In the situated view of work, people use rules, regulations, official procedures, etc. (the explicit view) as *resources* in their everyday work practices. This means that descriptions of regulations, procedures, etc. do not describe the *work practices*. They only describe the resources used by the users in their everyday actions to make the organisation function and to meet the organisational goals. Work can therefore not be described solely by rules and sets of operations (Winograd & Flores, 1986) i.e. it cannot be described as boxes and arrows alone.

Cooperative design (Greenbaum & Kyng, 1991) and user-centred design (UCD) suggest communication tools and design representations that better support the understanding of, and reflection on, current and future work practices. Mock-ups and prototypes are used to provide hands-on experience with the new technology and the possibilities it offers. Ehn and Kyng (1991) argue that mock-ups and prototypes facilitate a shared understanding of the work practices in relation to the new technology – and that they provide a "*….design language game that makes sense to all participants."* (p. 177). Other methods suggested in cooperative design and UCD are ethnographic approaches, focusing on the situatedness and complexity of the work practices, and how people interact and create meaning in their work (Suchman, 1987).

Our research is based on the view of work as a social process described above. The starting point of our research on systems development is the need

to facilitate communication between users and developers and a shared understanding of the users work practices. We therefore employ approaches and methods suggested in literature on cooperative design and UCD. In the next section (The studies) I describe and discuss our standpoint on cooperative design and UCD/UCSD[15], and our research on its application in real-life systems development.

4.5 Other theories

The theoretical framework discussed above provides the basis for my view on and my research on usability and systems development. In addition, I have applied theories from various fields as called for in my research. Theory can inform research in different ways. It can be used to precede and frame the inquiry, or it can be applied "after the fact".

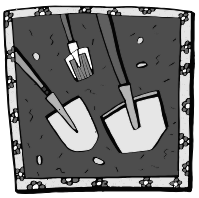
In papers VI and VII we based our inquiry into the work situation of civil servants, and the subsequent design of a case handling tool, on the model for stress-related occupational health disorders suggested by Karasek-Theorell (1990). This model relates stress at work to decision latitude (control), psychological demands and social support. The combination of high demands, e.g. workload and deadlines, and little control over ones' own activities and skill usage, creates psychological strain, which in the long run is detrimental to the well-being of the worker. Social support from colleagues and supervisors may buffer the strain. (For more information about the Karasek-Theorell model and how we used it, see paper VI.)

In paper I we discuss the usability designer role in systems development. In the course of the interview study it became quite obvious that the role originally defined only went so far in shaping and determining the set of responsibilities and activities performed by the individual usability designer. When analysing and discussing the factors that shaped the emergent role, we used the concept of role schemas (Clemmensen, 2002). Role schemas describe the sets of expectations that we have and that we apply to people in specific role positions. In this case, we applied the role schema theory "after the fact", i.e. in the analysis stage to help describe and explain an observed phenomenon.

[15] In the literature, user-centred approaches are sometimes referred to as user-centred design (UCD) and sometimes as user-centred systems design (UCSD) (coined by Norman, 1986). We have chosen to use the concept "user-centred systems design" (UCSD), in order to emphasise that it concerns systems development.

5. The studies

5.1 Methodological framework



This thesis comprises a number of different studies, all of which are related to my research questions in various ways.

The object of my research is systems development as it is practiced in real life. I see systems development as a social process, based on communication and interaction, and on social and cultural practices. My research is about understanding certain aspects of this social process and I have used a qualitative approach to do this. Qualitative research is primarily explanatory; it produces a deepened understanding of a social situation (process or setting), in that it focuses on the way the actors in the situation understand and interpret it, and take action in it (Miles & Huberman, 1994). However, this understanding is just one out of many since qualitative research is grounded in a philosophical tradition concerned with how the social world is experienced, interpreted, understood and produced (Mason, 1996).

My research has been primarily concerned with understanding obstacles to usability work as well as some of the factors underlying the problems described by usability practitioners. I have focused on how usability practitioners and other development team members think about and talk about usability and users' needs, and how these issues are represented and communicated in the process.

With one exception (paper II), we[16] have used qualitative research methods. The studies described in papers I and V are based on semi-structured interviews. Papers VI and VII describe design cases. In papers III and IV we have compiled and reflected on our experiences when working with and researching UCSD. We have also conducted a case study[17] which is briefly described in papers I and IV.

Paper II is based on a survey describing some key factors in usability work in Sweden. In this case, we wanted to get a broad picture of usability practitioners and their work and therefore used a web questionnaire. The purpose of the study was to investigate where and how usability practitioners

[16] We here refers to the research group to which I belong. As discussed above, my research is part of a larger research effort.

[17] For a more comprehensive account of the case study, see Öhman Persson (2004)

work in the Swedish industry, their skills and background, what methods and techniques they use, key factors for successful usability work, etc.

In paper IV we describe the outcome of our research in terms of principles. These principles should be seen primarily as communication devices. Such communication devices are commonly used in practical systems development for "packaging" knowledge and expertise into recommendations and guidelines that can be applied in development projects and organisations.

5.1.1 Data collection

I have primarily used semi-structured, in-depth interviews to collect data, and I will focus on the interview method in the discussion below.

Semi-structured interviews provide detailed qualitative data and allow for elaboration and follow-up questions. The questions asked during an interview are therefore partly determined by the data gained, which means that the interviewer has to analyse and interpret the answers instantly, while listening. Our interviews were based on interview guides. Such guides leave the phrasing and order of questions fairly open, but help maintain the focus. The interview guide is primarily a memory aid, and something one returns to a number of times during the interview to check that the relevant aspects have been covered. For example, in the study described in paper I we used three different interview guides for different groups of informants (usability practitioners, project managers and a user representative). These three interview guides covered similar themes, but the themes were seen from different viewpoints.

We have conducted the studies included in this thesis primarily within two Swedish organisations: an in-house IT development department in a large government organisation, and a consulting company that focuses on contract IT development and UCSD. In addition, we have talked to and interviewed people in a number of other Swedish organisations.

In qualitative research, the process of sampling or choosing informants is typically an iterative process, driven by the research questions and emergent findings. We have primarily relied on "snowball or chain" and "opportunistic" sampling strategies (Miles & Huberman, 1994). Choosing informants has been driven by our research questions. In most cases, we have turned to key informants who have been directly involved in the projects. The choice of development projects (paper IV) has primarily been driven by practical and "political" concerns. The projects we have followed have been "pilot projects" in which new development practices and methods have been tested. They were selected on the basis of several criteria (e.g. size and complexity) that were defined by us and our partner organisations.

There are a number of weaknesses associated with using interviews for data collection. The data may be biased by the interviewer, in this case

myself/ourselves. Interpretations are part of qualitative research, but sometimes an interpretation may be based on misunderstandings or the preconceptions of the interviewer, rather than on the data being generated in the interview. In some of our studies, we have tried to reduce the effect of such a bias by working together, interviewing in pairs, but conducting the initial analysis individually. This makes it possible to compare and discuss different interpretations.

Another major weakness is the bias of the informants. First of all, it is natural to want to come across in a positive light, which may make the informants overrate their impact and contributions, and/or underrate those of others. Secondly, the informants may feel concerned about criticising projects or people they work with or about expressing their views freely. Of course, the informants in our studies were promised anonymity, but in some cases, they may nevertheless be identifiable by people in their organisation. Moreover, the data in an interview is based on recollections of events rather than the events in themselves, weakening the reliability of the data. However, we have followed the organisations over a period of time, and the views and statements expressed in the interviews are consistent with what we know from other studies, for instance, the case study described in papers IV and V.

5.1.2 Analysis

When possible, I have taped the interviews and then transcribed them. The transcriptions are not verbatim, in that I usually leave out repetitions, fill-in words such as “uhs” and “ers”, etc. I have not included non-verbal aspects as data, with a few exceptions (for instance, being interrupted). This means of course, that the act of transcribing is in itself an act of selection and interpretation, based on the data that I believe has meaning for my informant and for me. The transcriptions have been the main source of data, along with the notes taken during the interviews.

I have found that transcribing the interviews is very helpful. I “relive” the interview, but when transcribing I am under no pressure to analyse and interpret in real-time. Instead, I have the opportunity to listen carefully to the exchange once again. This act of listening and transcribing helps highlight important points and reveal patterns and themes.

The next step in the analysis is to arrange the data in accordance with themes or codes based on my interpretation of what the informants said. The codes were partly determined by the themes and questions used in the interviews, and they emerged partly during the process of transcribing and analysing the interviews. Hence, I have used a mixture of a priori codes and inductive coding (Miles & Huberman, 1994). Categorising, or coding, the data is an iterative process, where emerging codes require that I backtrack

and re-categorise data. Many times, a chunk of data (a sentence, or more often a group of sentences) will fit under two or even three different codes.

Once I have categorised and sorted the transcriptions of the individual interviews (in Microsoft Word™) I then print them and use the scissors to cut them up and rearrange them across the different interviews. I have found that the tangible and hands-on nature of using real paper and scissors makes me see the data in new ways. Categorising the interview data across the individual informants helps in achieving an overview of and a feel for the data. It also discloses salient points, patterns, differences and contradictions that may be worthwhile to pursue.

This process of transcribing and categorising the data across the interviews is important in order to avoid basing the analysis on my own unrecorded memories and impressions of the interviews. It is inevitable that such "on-the-spot" impressions will guide the analysis to some extent by providing analytical "handles", but they are not data in themselves.

"Writing up" (Wolcott, 2001) the data means revisiting the research problem and looking for the salient points, patterns, etc. in the data that can help answer the research questions. It means making connections between the data, the research questions and relevant theories and research in order to create a "whole", i.e. an explanation that is consistent with the data, with the context of the study, and with the interpretations of the members of that context – in other words, an explanation that will deepen the understanding of the research problem.

5.1.3 Sharing common ground

Earlier in this thesis I discuss the concept of common ground (see the section on my theoretical framework). For almost ten years, I have worked as a practitioner with the issues that we study, i.e. UCSD and usability in systems development. This means that to some extent, I share common ground with the informants, e.g. educational background and practical experiences (papers I and V).

This shared knowledge is an important factor in my research, and it is a strength as well as weakness. It is strength in that it facilitates my understanding of the experiences recounted by the informants. In the interviews, the informants referred to a knowledge base about what it is like to work in a systems development project. Since I share this base, it became a common ground to which we both could appeal in order to assess our understanding of what was being said. I could relate the experiences of the informants to my own experiences of working with systems development, which has helped me interpret the answers and formulate follow-up questions.

However, this common ground can also bias my understanding of the data. I may jump to conclusions about what the informants say, based on my own preconceived ideas about systems development and usability. I may

also be prone to look for accounts that confirm my own experiences and ideas, and disregard those that contradict them.

Discussing my analysis and conclusions with my colleagues has been one way of avoiding this bias. Feedback from informants is another one.

5.1.4 The epistemological privilege of the researcher

Sharing common ground with my informants does not imply that I consider myself as having an epistemological[18] privilege – i.e. that I am better equipped to understand how the informants feel about their position and experiences as compared to researchers who do not share my experience (Mason, 1996). However, I would like to argue that while my experience may not place me in a better position, it definitely places me in a *different* position. I understand the language used in systems development, and am familiar with the context as such. In fact, Miles and Huberman (1994) argue that a good qualitative researcher should have some familiarity with the situation or context he/she studies, since unfamiliarity with the context may lead to easily misguided fieldwork.

And according to Mason (1996), nor do the *informants* have any privileged position in evaluating the outcome of the research. Mason argues that they are not in a position where they can evaluate the consistency or accuracy of a theory or conceptual model. It seems to me that this idea is based on the notion that the researcher always has epistemological privilege over the informants. People who are involved in a particular social context or situation are not able to see and reflect upon that which is taken for granted in that context. I am not quite comfortable with this notion. I do not want to argue that one should take the informants explanations and statements at face value, realising that they may lack reflection and be fallible (Miles & Huberman, 1994). But I do not feel comfortable with the "the researcher knows best" attitude, and the idea that theoretical knowledge and the ability to reflect upon that which is taken for granted is the exclusive domain of the researcher.

The practitioners we work with are trained in conceptual and theoretical thinking. Theories or conceptual models can help them reflect on their everyday practices and the taken-for-granted notions that underpin them. We have worked together with them to co-construct new theoretical knowledge based on their practical knowledge and their practice, creating a "lever" for making changes in this practice and their knowledge. This goes beyond the "member check" technique for getting feedback from informants – for instance, having informants check and comment on transcripts, summaries of the findings and conclusions (Miles & Huberman, 1994).

[18] Epistemology addresses the possibility, origins, nature, and extent of human knowledge, i.e. what we can know about the world. (www.philosophypages.com)

5.2 Conclusions and discussion

My main research question concerns how and why usability issues and users' needs typically "get lost", i.e. are marginalised or even abandoned, in practical systems development. The studies presented in this thesis all attempt to answer detailed questions related to my main question. Table 2 shows how the detailed research questions are related to the studies.

5.2.1 Why does usability get lost?

Our studies point to a number of factors that all play a role in the difficulties associated with addressing usability issues and users' needs in systems development. Below, I will briefly summarise and discuss some of these. For a full account, please refer to the studies included in this thesis.

Organisational matters

The organisations we have studied organise their systems development primarily as separate projects, conducted by an internal but separate development organisation (in-house development), or by external consultants (contract development). Grudin (1991) discusses some characteristics of the different types of development projects, pointing in particular to organisational obstacles to user involvement and to communication between users and developers.

In our studies (papers IV and V) we have identified some factors that may indicate that there is a problem in how IT development is organised into separate organisations and projects. For instance, IT development is often separate from the organisation development process. Work practices, labour division, roles, etc. are modified and re-designed afterwards, as a result of the design of the IT system. Long-term effects of new IT systems – for instance, productivity, satisfaction and users' well-being – are difficult to address in this model. Usability and health effects have to be evaluated over an extended period of time, whereas the project is based on a "deliver and disband" approach. It is therefore difficult or even impossible to hold the project accountable for long-term effects. Rather, a focus on short-term goals and effects is encouraged instead.

Table 2. *The relationship between the different studies and my research questions*

Research question	**Study**
What happens to usability and users' needs in the development process –why are they marginalised or abandoned?	Paper II This paper reports on a survey of usability practitioners in Sweden, covering aspects such as user involvement and obstacles to usability. Paper V In this study, we particularly focused on obstacles to usability work and user involvement in systems development. We interviewed usability practitioners, developers and users in two organisations.
What do usability practitioners think about usability work in systems development? How do they view their own work situation? What are their views on the difficulties in maintaining a focus on usability?	Papers I and II Paper I is based on interviews and paper II on a survey. These two papers describe how usability practitioners view their work and their work situation.
How can usability and occupational health issues be integrated in systems development? How can the focus on these issues be maintained throughout the development process?	Paper IV In this paper we compile several years of research on and practical experience of systems development into key principles for UCSD. These principles aim at maintaining a focus on usability issues and users' needs throughout the lifecycle of the system. Papers VI and VII These two papers describe a design case, where we tested methods addressing the users' lack of overview and control over their work (a risk factor for stress-related disorders) in designing a prototype for electronic case handling.
What happens if you introduce a role that specifically addresses usability issues and users' needs in systems development?	Paper I This paper describes an evaluation of the usability designer role. We interviewed usability designers, project managers and a user representative in two organisations. Paper III In this paper we reflect on the usability profession – the role, the process and the individual.

Projects and practices

Systems development is often a very complex process, involving a fair number of people over an extended period of time. Continuous changes in external and internal factors and constraints require continuous adaptation and reorientation of the project. Usability is just one out of the many factors that the development project must take into account (paper I).

Clegg, et al. (1997) report that changes involving IT development are predominantly technology-led and that existing project management methods and tools reinforce the technical focus, in that they neglect human and organisational issues. Our case study (papers IV and V) confirms this. The project focused on producing the artefacts and documents prescribed in

the development model, which obscured the goals and needs of the users. Producing use cases became a goal in itself and more important than understanding the users' needs. The same project was subject to a decision about the technical platform that was beyond their control and made with little concern for usability matters.

The developers in our studies often referred to deadlines controlling their work. When there is a priority conflict between usability and time, deadlines put a stop to usability efforts. Iterations are short-circuited by deadlines and pressures of time force projects to focus on technical solutions for getting functionality in place (papers I, IV and V).

User involvement

User involvement was generally considered essential. The survey (paper II) indicates that user involvement is an important factor in systems development, but that there are many obstacles. In our interview studies, the user representatives felt that their presence and contributions were appreciated by the developers, and the developers pointed to the importance of involving users (paper V).

However, the user representatives in some of these organisations often work part-time or full-time in the projects, and some of them move from one project to the next one. They soon lose touch with the work practices and everyday problems of their fellow users and become IT workers of a kind. The user representatives become steeped in the language of the development team, for instance, referring to "use cases and requirements" instead of work and work practices (papers IV and V).

There are, furthermore, obstacles to user involvement including finding the right users, gaining access to them, and maintaining their involvement throughout the project (e.g. Grudin 1991; Poltrock & Grudin, 1994; Wilson et al., 1996 and 1997). The informants in our studies described similar problems and obstacles, which may imply that not much has happened to improve the situation (papers I and II). In fact, there seems to be a trend away from user involvement based on the argument that users do not know what they want and do not have designer skills (e.g. Constantine & Lockwood, 1999; Cooper, 1999).

User involvement does not in itself guarantee usability. Design representations, models and artefacts are particularly important in this respect. Design representations based on unfamiliar notations are difficult for users to understand. In the case study project, users who were invited to evaluate models could not understand and appreciate the effects the new IT system would have on their work (papers IV and V). Effective user involvement requires that the project uses design representations (e.g. prototypes) that are based primarily on the social language and practical knowledge of the users, which in turn facilitates an understanding (common ground) of the future work situation.

Attitudes about usability

Many of the problems we have identified in our studies are related to attitudes about usability.

Some of the developers and project managers in our studies considered usability a matter of user interface design, i.e. something that is put on by means of an easy-to-learn-and-use user interface (papers I and V). This attitude to usability does not acknowledge the importance of utility and its relation to functionality. When this attitude was held by the project manager, the usability designer was restricted to designing the user interface (or creating guidelines for designing the user interface) for services and functions specified by others. The usability designer became little more than a user interface designer, with limited decision powers in usability matters (paper I).

Our studies indicate that usability was considered a "fuzzy" and difficult concept (paper I). Usability work was not integrated as a natural part of the development process, and the responsibility for usability and related issues was vague. The developers placed the responsibility for usability with "somebody else". It had nothing to do with what they were doing (e.g. programming or creating models). They pointed to the usability expert, or when no usability expert was around, to the user and/or client representatives (paper V). The usability designers (paper I) pointed to the project manager, who pointed to the client or the project steering group. Unclear delegation of responsibility may in itself become an obstacle to addressing usability, increasing the risk that it is marginalised.

Nevertheless, what the developers do has an impact on usability. In many projects, there is little or no dedicated design regarding usability and user interaction. The interaction design emerges when the developers carry out such activities as modelling and coding. Symon (1998) describes how developers take the lead when meeting and interacting with users. The developers "orchestrate the design decisions" in the way they select and present the different options, thereby controlling the outcome of the discussion. Nevertheless, in the study described in paper V no developer considered interaction design decisions his/her responsibility. Nearly all informants (developers and usability practitioners) pointed to the user and client representatives in the projects.

5.2.2 The usability practitioner

A majority of the usability practitioners in the survey (paper II) had a background in computer science or engineering, had done HCI as part of the program or as on-the-job training, or were autodidacts. These findings may imply that the typical usability practitioner in Sweden is a former systems developer with an interest in usability issues. Having a developer

background may be an advantage when communicating with developers. On the other hand, usability is a complex issue and must be understood as such. A usability practitioner with a background in cognitive/behavioural science has superior knowledge about cognitive capabilities and limitations and the social processes at play in a workplace. The question is how much that knowledge counts in a technically oriented development organisation where human and organisational factors are typically marginalised (Clegg et al., 1997).

Both the respondents in the survey and the usability designers (papers I and II) described difficulties with establishing their roles in the development organisations, processes and projects. They also pointed to the importance of support from management, specifically the project manager(s). The usability designer role was not yet a natural part of the development process and the usability designers had to spend considerable time explaining and justifying their role in the projects. Support from the project manager was essential in this process. Nevertheless, once the role was established in a project, it seemed to fill a need in providing answers to the developers' questions about the users' needs, as well as an interaction design.

It was evident in the study on usability designers (paper I) that a formal role description only went so far in defining the areas of responsibility and power given to the usability designer. Establishing the role and creating a place in the project meant fleshing out the role with expertise, methods, techniques, and the kind of authority that comes with knowledge, experience and seniority. Roles are partly defined by "role schemas" (Clemmensen, 2002) describing the expectations that we have and how they are applied to people in specific role positions. This means that the work the usability designer actually did and what decisions he/she made in the project were partly defined by the official role description, partly by the professional abilities and expertise of the individual role holder, and partly by the expectations and experiences of the other team members.

5.2.3 UCSD – focus on usability and users' needs

How can usability and users' needs be integrated into the systems development process? In our opinion user-centred systems design (UCSD) provides a way of resolving these issues. UCSD is neither a theory nor a method; rather it should be seen as an *approach* to practical systems development.

In paper IV we have compiled several years of research on and practical experience with UCSD that we then have used to establish a definition and a number of key principles. These principles are based on earlier research and "best practices", as well as our own research and practical experiences in the area. They borrow from different traditions and approaches, primarily cooperative design (the Scandinavian school, Greenbaum & Kyng, 1991),

user-centred design as suggested by Gould, et al. (1997) and represented in ISO/IS 13407 (1999), usability engineering (Mayhew, 1999) and interaction design (Kapor, 1991; Crampton Smith & Tabor, 1996). Below, is our definition of UCSD (for a full description, please refer to paper IV).

User-centred system design (UCSD) is a process focusing on usability throughout the entire development process and further throughout the system lifecycle. It is based on the below key principles:

- *User focus* – the goals of the activity, the work domain or context of use, the users' goals, tasks and needs should guide the development from early on in the project
- *Active user involvement* – representative users should actively participate, early on and continuously throughout the entire development process and throughout the system lifecycle
- *Evolutionary systems development* – systems development should be both iterative and incremental
- *Simple design representations* – the design must be represented in such ways that it can be easily understood by users and all other stakeholders
- *Prototyping* – early and continuously, prototypes should be used to visualize and evaluate ideas and design solutions in cooperation with the users
- *Evaluate use in context* – baselined usability goals and design criteria should control the development
- *Explicit and conscious design activities* – the development process should contain dedicated design activities
- *A professional attitude* – the development process should be performed by effective multidisciplinary teams
- *Usability champion* – usability experts should be involved early and continuously throughout the development lifecycle
- *Holistic design* – all aspects that influence the future use situation should be developed in parallel
- *Processes customisation* – the UCSD process must be specified, adapted and/or implemented locally in each organisation
- A *user-centred attitude* should always be established

These principles should be seen as recommendations and guidelines, or "best practices". They embody approaches and attitudes that, in our opinion are essential in systems development.

The principles are based on certain standpoints regarding the relationships between users, developers and technology. Below, I discuss some of these standpoints, as well as some of the problems with UCSD since it is by no means an unproblematic approach. I pay particular attention to the cooperative design approach since it provides an important theoretical and historical background to these key principles. However, the principles are

not a mere application of cooperative design in practical systems development – they also borrow from other approaches.

The discussion is in no way exhaustive. However, it touches upon certain aspects that I believe require elaboration and further research.

UCSD – democratic or functional empowerment?

Cooperative design, as described in Greenbaum and Kyng (1991), is based on the design ideals that IT systems used in the workplace should be designed with full participation from the users and with the use situation as the starting point. IT systems are tools that should be under the control of the users, and they should enhance workplace skills and the quality of the work results. Moreover, Greenbaum and Kyng describe the design process as political, involving conflicting interests. These ideals are laden with political standpoints about workplace democracy and worker empowerment.

Spinuzzi (2002) discusses the difference between democratic empowerment which gives workers a decision-making role in IT development (as reflected in cooperative design[19]) and functional empowerment, where workers are given a degree of power over how to execute their tasks in order to improve their performance. Democratic empowerment focuses on conflicting goals and interests between employer and workers, emphasising the needs of the workers, whereas functional empowerment relies on the convergence of employers' and workers' goals and motivations. In practical systems development, democratic empowerment is rarely the purpose, or even possible, despite the fact that there are often conflicting goals that may have far-reaching consequences. Our principles are based on the functional empowerment approach, where workers or work groups are held accountable for the results of their work, and in return are given some action space and power over how they perform their tasks.

We have therefore defined UCSD as a process focusing on *usability*, placing less focus on the political aspects of worker empowerment in the design situation. Our usability focus does not mean that we abandon the ideals of user participation in cooperative design. User involvement, or worker involvement, is a strong tradition in Scandinavia, and moreover required by the Swedish Work Environment Legislation (Swedish Work Environment Authority, 2001). However, our principles address user participation based on functional roles in the organisation, rather than interest groups, e.g. unions (compare Nygaard, 1986).

We focus on systems development as *practiced* within the current political and economical structures and constraints of organisations and companies in Sweden. As a consequence, we have felt the need to de-

[19] Spinuzzi primarily discusses the UTOPIA project that made a major contribution to the Scandinavian approach.

emphasise the political implications of cooperative design in terms of worker empowerment.

The user

Our principles are based on the view of people as active, controlling actors (Bannon, 1991). This is a view that I share, and one that was important to me in my work as a practitioner. Cooperation with users must be based on respect for them as skilled, knowledgeable and active practitioners or workers. It is just as much a matter of how we act with respect to the users, as it is a question of what we do with them. (Wynn, 1991).

However, the user concept is in itself problematic. It carries with it implicit notions of users being passive and subordinate to the computer, or worse that they are "naïve" users and "computer illiterate". The "human actor" concept described by Bannon (1991) suggests a different and potentially more fruitful way of viewing the people who use IT in order to achieve goals and to interact with other people. It connotes active participation, control, skills and expertise. Unfortunately, the "actor" concept is used in object-oriented systems development (see for instance, Jacobsen et al., 1999) to describe a component in a system (a human being *or* an artefact). This use of the actor concept reflects the systems perspective (Kammersgaard, 1990) where humans and computers are viewed as having the same characteristics, abilities, and resources. Since the object-oriented approach is rather influential, I believe it difficult to reclaim the actor. This leaves us the options of keeping the "user" or trying to find yet another concept for that elusive person. In our research, we have chosen to stay with the user concept, since it is commonly used in practical systems development.

Another problem with the user concept is that it defines a category of people in relation to an IT system (Westrup, 1997). Users are basically not users until an IT system comes along, or until they become part of the development process preceding it (either directly involved, or indirectly in terms of being categorised as the recipients of the new system). This means that the user concept creates a *new* "position" for people in the organisation; a position that is based on their relationship to the IT system. Being a user is *not* the same as having whatever role one has in the organisation (civil servant, radio base station test engineer, travel agency sales clerk, etc.). Nevertheless, the user position is supposed to be representative of that very role. But, the position of the user (representative) in the development project is often unfamiliar and difficult. New relations shape the action space and the decision latitude that the user representative is given, and the familiar ground of ones organisational role may erode in the unfamiliar surroundings of the development project.

Work practices and organisational goals

In the Theoretical framework section, I discussed the social and situated nature of work and the complex network of interaction, communication and coordination that takes place in any work activity. In systems development, it is therefore essential to involve users as co-designers since they are the only ones who can provide reliable accounts of their actions (Greenbaum & Kyng, 1991).

People do things at work in particular ways because they have goals – individual as well as organisational. The organisational goals provide a social structure or a set of resources that the individual worker uses in order to get her/his job done. So how do you get at this structure? Is it possible to do that with a user-centred approach, focusing on the users alone? Does structure come automatically with the users?

Vicente (1999) argues that relying on users (workers in Vicente's terminology) alone may be deceptive. In order to understand a socio-technical system, it is necessary to move beyond the accounts of the individual workers since they may be mistaken about parts of the structure that shape and constrain the work situation. Therefore, Vicente advocates Cognitive Work Analysis (CWA) where the work activity is described by a complex set of constraints on different levels. I believe that CWA may be useful in situations where there is a material reality that places essential constraints on the work situation (such as power plants or chemical plants). However, I believe that it is less suitable for understanding administrative work, or knowledge work, relying more on social interactions than on the material world, since the models used in CWA tend to create static representations of the work situation. Nevertheless, administrative work also contains structure.

Sachs (1995) describes this tension between structure and the user viewpoint. She suggests that systems development projects need to take into account two views of the work situation. The explicit, official view of work (i.e. structure) as described in process documents and instructions and the activity-oriented view of work, which reflects what people really do in order to meet the organisational and individual goals. Berg et al. (1998) on the other hand argue that structure is not to be found in official accounts of work but is embodied in the real work practices on the shop-floor.

Nevertheless, I believe that there are structures and goals that may be difficult to identify with an exclusive focus on users and their day-to-day work practices. These structures and goals need to be made part of the design problem. They need to be taken into account as resources in the work situation.

The tool metaphor is another problem in relation to the users' needs and work practices versus structure and organisational goals. The tool metaphor is an important component of the design techniques and activities suggested

in cooperative design, e.g. prototyping. A tool is in the hands of and under the control of its user. The hammer is literally in the hands of the carpenter, who uses it for very particular purposes that are under his/her full control. However, IT has characteristics which are obscured by the tool metaphor (Westrup, 1997). Zuboff (1988) points out that IT has an *informating* capacity, in addition to its automating (tool) capacity, in that it "…generates information about the underlying productive and administrative processes through which an organization accomplishes its work" (p. 9). The informating capacity is rarely reflected in representations such as prototypes or mock-ups, which focus on the hands-on experience of new work practices. This means that the informating capacity may be obscured in the design process. But this capacity is present and it may be used for follow-up and control of the use and the users in a way that is never disclosed or discovered in the design process – on purpose or unintentionally.

In Sweden, secret surveillance of workers is prohibited. But we have talked to people who feel uncomfortable just knowing that the IT systems *can* be used to monitor their performance and productivity on an individual level, even when the systems are not explicitly used to that end (current project).

5.2.4 Summing it up

To sum it up, the results in our studies indicate that usability maturity remains fairly low and that usability issues are often marginalised in practical systems development. Usability is not a natural part of the development process. The usability practitioners in our studies felt that their role was vague and that their action space was restricted. We have also seen a systems development project derailing from its usability focus owing to technical and methodological issues taking precedence and to decisions being made without taking usability into account. The obstacles to usability and users' needs issues include resistance to usability and user involvement, and attitudes that regard usability as a user interface matter.

Our research confirms findings reported elsewhere, for instance, that obstacles to usability include resistance to usability, lack of understanding of the usability concept, constraints of time and resources and lack of trained usability experts (Rosenbaum, et al., 2000; Gunther, et al., 2001). Clegg et al. (1997) report that changes involving IT development are predominantly technology-led and that usability is perceived as a matter of user interface technology. McCoy (2002) lists a number of barriers to adopting usability in systems development organisations. These include separation between users and developers, users being "captive" and lacking power and project management methods that focus on deadlines and budgets rather than on quality and users' needs.

As described in our key principles, we suggest UCSD as an approach for integrating usability issues and users' needs into systems development. I have discussed above certain aspects and standpoints of UCSD. This discussion should not be read as an argument against usability work, UCSD and involving users as active participants and co-designers. On the contrary, I agree with the design ideals expressed in Greenbaum and Kyng (1991), where users are seen as capable practitioners or workers, having expertise, knowledge and skills that are crucial in the development process. I see users as active agents, being experts in their own domain, using IT systems as tools (Kammersgaard, 1990) to perform their tasks.

However, involving users does not automatically provide them with the action space and decision powers needed to influence the development process. Westrup (1997) describes some of the issues that need to be addressed in relation to user involvement: who represents whom, how is the user representative role legitimatised in the eyes of those being represented, and the issue of formal and informal power relations – to name just a few.

5.3 Transferability

Action research and qualitative research produce knowledge and insights that are grounded in the specific context being studied. However, the outcome may be generalised or transferred to similar contexts by means of a process of careful interpretation and translation (Miles & Huberman, 1994). The transferability to other contexts depends on their similarity to the original context in terms of key characteristics and aspects. Below, I discuss the context of our research and describe some of the key characteristics.

We have conducted our research primarily on bespoke systems development in the workplace, conducted by in-house development organisations or by contractors. Usability in the workplace is about the fit between work practices on the one hand, and the IT systems on the other. Hence, usability is about understanding and designing for the users' work and needs in relation to the organisational goals.

These aspects make active user involvement essential in bespoke systems development. In bespoke development, the users are known and accessible, whereas e.g. product development is targeted at a group of potential users who are unknown and therefore not accessible (Grudin, 1991). Hence, the methods and approaches for involving users differ between different development contexts.

User involvement in bespoke development has its origin in the movement of worker emancipation and workplace democracy that had great impact on the relationships between employers and workers in Scandinavia in the 70's and 80's, and continues to do so. Our key principles play down the role of the political legacy of user involvement, focusing on functional

empowerment of the users rather than democratic empowerment of workers. Yet the legacy is there, with the political standpoints underpinning it and it cannot be disregarded. This legacy is played out in different ways in different cultures and contexts – for instance, the role of unions in representing users/workers (Spinuzzi, 2002) and the degree of autonomy given the individual user/worker.

Nyce and Löwgren (1995) discuss the importance of cultural aspects in relation to cooperative design. The authors argue that the idea of involving users as co-designers on equal terms with the developers is based on "a particular set of beliefs about language and action" (p. 43). They compare Scandinavia to the U.S., and argue that the views of language as action differ. Meeting with users and talking to them have different connotations in these two cultural contexts. Of course, there are other types of cultural differences, perhaps even more pronounced, between Scandinavia and other parts of the world where software is now being developed.

Furthermore, the views of work discussed in this thesis may be more or less pronounced in different work contexts. Our research has focused on the development of IT used in administrative work. The kind of administrative work carried out in our research contexts involves primarily problem solving and decision making – e.g. gathering, integrating and assessing the information required to make a decision regarding a claim – but also routine tasks. Characteristics, such as type of work and work contents may have impact on the way workers (users) and their work are viewed and on their position in the IT development process.

The concerns discussed above have to be addressed and resolved when transferring concepts and practices between development contexts and between cultures.

5.4 Reliability and validity

In qualitative research, reliability is about making sure that data has not been invented or misrepresented. It is also about making sure that the data collection and analysis have been systematic, and "…thorough, careful, honest and accurate" (Mason, 1996, p. 146). Validity is a matter of whether or not I explain what I claim to explain, and what makes my interpretation valid. Why should my audience accept my interpretation over that of others?

In my research, I have primarily used semi-structured interviews with key informants - for instance, people working directly or indirectly with usability issues in systems development. In The studies section, I discuss some issues related to reliability and validity, e.g. how data was collected, transcribed and analysed in our studies. In each step, I have taken care not to misrepresent the data and to avoid basing my analysis on unrecorded memories and impressions from the interviews. I have also reflected on and

discussed the categorisation of the data, and how the data is connected to the research questions and the explanations. The interviews reported on in the papers were either conducted by me and/or by my fellow researchers[20]. Working in pairs strengthens the reliability and validity of the data. As described above, we conducted the interviews in pairs, but performed the initial analysis individually. We then compared our interpretations of the data.

Moreover, the interview studies are part of a larger action research project comprising other studies. The findings from the different studies are consistent where applicable.

5.5 Brief note on our partner organisations

Our research has been performed with financial support from the Swedish National Tax Agency (Skatteverket), the Swedish National Social Insurance Board (Riksförsäkringsverket-RFV), the Swedish Agency for Innovation Systems (VINNOVA) and the Swedish council for working life and social research (FAS).

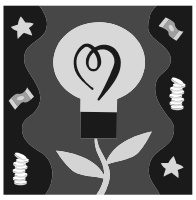
Skatteverket and RFV have also participated actively in our research projects. We have worked together with employees in these two organisations, with the specific aim to redesign the systems development processes and practices in order to improve usability and the users' work situation. Key individuals in our partner organisations have been given the opportunity to check the outcome of our research as presented in e.g. articles and conference papers.

Naturally, the questions and issues we have explored have been aligned with the needs in our partner organisations. However, we have had a high degree of freedom regarding the direction of our research and the questions we have investigated. Moreover, the people who have been responsible for making decisions regarding the financing of our research have not been directly involved in the research activities. The people we have worked together with belong to other parts of the organisations.

[20]The interviews in paper I were conducted by me and my supervisor. The interviews in paper V were conducted either by me, or by one or two of my colleagues.

6. Reflections

6.1 Introduction



One of the real joys of doing research is the opportunities it offers for reflection. Below, I have taken the liberty to put down in writing some of my reflections concerning the problem of why usability and users' needs get lost. I argue that the problem can be related to the difference in views of work described in the Theoretical framework section. This difference creates an inherent conflict or tension in systems development – a conflict between the systems theoretical (boxology) way of describing work and the situated nature of work as a social process.

This conflict has been extensively discussed, see for instance (Nygaard, 1986; Winograd & Flores, 1986; Greenbaum, 1990; Greenbaum & Kyng, 1991; Sachs, 1995; Clegg, et al. 1997; Gedenryd, 1998; Harris & Henderson, 1999; Fällman, 2003). Below, I draw on this literature, when discussing the problems that the usability practitioner faces on the shop-floor level of project work. I argue that the conflict is in itself an obstacle to focusing on usability and users' needs in IT systems development in the contexts that we have studied.

In my reflections I focus on the *representations* of work used in systems development, since the view of work is embodied and institutionalised in these representations. I do *not* criticise systems developers as individuals. Popular belief holds that the blame lies with the developers. It is suggested, on a slightly frivolous note, that developers are a particular kind of human being (e.g. Cooper, 1999) who are inept at communicating with and understanding "normal" people (i.e. users). I do not agree with this view, even though I know from personal experience that "mastering" the computer can be tremendously rewarding. Solving a programming problem can be completely absorbing and users' needs and usability issues are easily forgotten. But this does not explain or excuse why *projects* fail to deliver usable systems.

I would also like to emphasise that the discussion below is by no means an exhaustive account of why usability gets lost. Systems development is a highly complex social process and problems encountered in this process cannot be accounted for by one single explanation. My discussion is just *one*

out of many ways of understanding why usability gets lost in bespoke systems development.

6.2 My background and experience

My background and working experience with usability in systems development have been particularly important to me in my research. I have spent much time reflecting on my earlier practical experiences of systems development from a novel point of view, namely a deepened and more theoretical understanding of the development process and the issues dealing with usability and users' needs. This is a kind of retrospective reflection from new angles creating new insights. Making use of previous experiences in this way has been very valuable to me in framing and reflecting on my research problem.

My background in engineering is also an important factor. I have experienced engineering-oriented problem solving and boxology from the inside. I spent almost 5 years at university doing engineering and came out with an engineering-oriented approach to solving problems. I have then worked with different technologies and their use, in the telecommunications industry and the IT industry, in companies where the engineering-oriented approach has been a part of the organisational culture.

However, I soon came to realise the limitations of the engineering-oriented way of thinking when applied to human activity, particularly when dealing with usability issues and user requirements in my work as an IT consultant. My Ph.D. studies have given me the opportunity to reflect on and better understand the differences in and tensions between the different views of human activity and work. In some sense I have made an "interdisciplinary journey". This journey – shifting from one way of thinking about the world to another – is closely connected to the way I have come to understand the systems development process and the inherent conflict and tension between the different views of work.

Hence, the reflections below are based on my own experiences, in addition to my research studies. I have also read literature from a number of disciplines – HCI and cooperative design of course, but also occupational health research, Information Systems (IS) research, software engineering and gender theory. The literature provides a supporting scaffold and a kind of pattern into which I have tried to fit my experiences and the results from our studies – comparing, interpreting and re-interpreting the new pattern, or picture, that has emerged.

Writing this summary and discussing with my colleagues and supervisors have been a very important part of this process of reflection. Paraphrasing Descartes, I would like to argue that "I speak and write, therefore I think".

6.3 Representations

Many approaches to systems development have their roots in the engineering-oriented approach to problem solving (Greeenbaum, 1990) and use representations (e.g. models) that are based on the systems theoretical (ST) perspective. As discussed in the Theoretical framework section these representations are based on the assumption that the design problem, i.e. the users' work, can be described in terms of sets of pre-defined operations, making up the whole picture (boxology). In my experience, questions are rarely asked about what knowledge and aspects are *excluded* in these representations.

On the other hand, work is a highly complex social process. Work practices are contextual and situated. Human beings are adaptive, flexible and innovative. Moreover, we create and understand our social reality by means of language, the meaning of which is fluid, contextual and social. In short, work cannot be described solely by rules or pre-defined sets of operations and steps (Winograd & Flores, 1986; Greenbaum & Kyng, 1991; Sachs, 1995).

Thus there is a tension and conflict between the boxology way of representing the users' work and work practices in well-defined models, and the "messy" nature of those work practices, as illustrated in *Figure 1*.

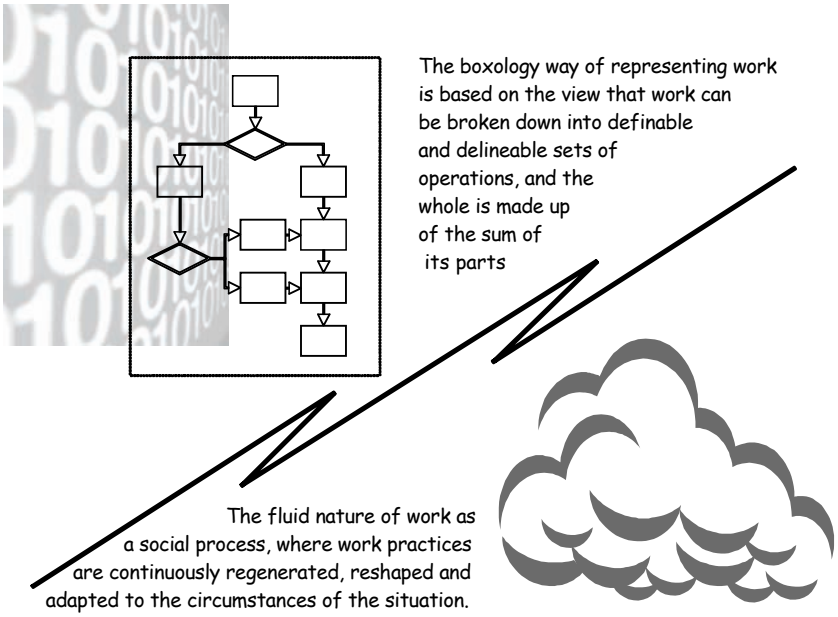


Figure 1. Illustration of the boxology way of describing work in contrast to the situated and complex nature of work and work practices

As a consequence, there is a tension between how the users experience and understand their everyday work situation and the representations (models) that are used in systems development and this makes it difficult for users to participate in the design process. I do not believe that such difficulties can be explained by an inability of the users to reason on theoretical levels about their work (as discussed by Luria, 1976). The users in our partner organisations have all spent several years in school, and many of them have academic degrees (e.g. law or economics). There is little reason to believe that they lack the training and the ability to think in theoretical and conceptual terms. And they are not computer illiterate or naïve users. Most of them have *used* computers in their work or elsewhere for many years.

I would like to argue that the difficulty originates in the representations. They simply do not describe the nature of work particularly well, in that they break down work into operations, steps and boxes. The representations often describe process flows and information flows instead of work practices – i.e. the explicit view of work (Sachs, 1995). And yet, the models are assumed to represent the tasks and work practices of the users, and are used as input when designing the interaction between the users and the IT system (paper V). But, the users do not recognize their work practices in these representations. The representations do not describe their work in a meaningful way. In the case study (papers IV and V) one of the user representatives who had worked with use case modelling for some time said that starting with collaborative prototyping was like "coming out of a long dark tunnel". In one of our interview studies (paper I), a user representative described the modelling sessions he had been involved in:

> "… in the beginning… then I found it [use case modelling] very difficult, but now I start to get the hang of it. It's taken a long time… if I worked with this, I would work with more practical means… pictures and everything…"

What these people seem to feel was missing in the use case modelling ("long dark tunnel") are concrete representations of the future IT system, that can better describe what the future work situation will look like ("pictures and everything") and can provide more hands-on experience ("practical means").

6.4 Abandoning boxology?

If the models used in development can only provide fragmentary understanding of the users' work, why are they not abandoned? Below, I briefly discuss two factors which, in my opinion, make it difficult to abandon the boxology approach: the traditions of Western philosophy which favour a certain type of knowledge, and the nature of the computer.

Naturally, one cannot neglect the political and economic structures and constraints that shape the formal and informal power structures within which systems development is embedded. Another issue is the organisation of IT development into separate organisations and projects, where deadlines and requirement specifications control the development. However, I will not discuss these matters here, since I primarily address the shop-floor level of the development project.

6.4.1 What kind of knowledge counts?

Taking the above discussion about representations as my starting point, I would like to argue that we need to ask some specific questions: what counts as *valid knowledge* in the development process, what type of knowledge is *obscured*, and *why* does this happen?

Winograd & Flores (1986) argue that in the Western philosophical tradition, detached theoretical thinking is considered superior to practical knowledge – "..the involved practical viewpoint" (p. 32). The authors argue that much of the thinking in the Western tradition is based on a "rationalistic" approach that seeks to describe the problem in terms of objects with well-defined properties, and rules that may be applied logically to the problem.

In systems development, this attitude towards knowledge and thinking favours representations that describe work as sets of operations and steps, focusing on the formal, and intellectual aspects of work (Nygaard, 1986; Greenbaum, 1990; Harris & Henderson, 1999). These representations are assumed to provide an "objective" (neutral) and therefore more "true" understanding of the users' needs (Beath & Orlikowski, 1994). This line of reasoning does not acknowledge that this understanding is also an interpretation of the situation, based on certain assumptions.

Practitioners (users) of any kind have a practical knowledge about their work, an understanding about "what-to-do" as well as "how-to" in a specific situation (Schön, 1995). As discussed above, the representations used in systems development typically do not accommodate this kind of knowledge. In real-life systems development, there is rarely the time to complement the representations (models) with other types of knowledge. This means that the developers' understanding of the users' work practices is based on representations that are lacking in practical, situational understanding of the work situation[21].

Beath and Orlikowski (1994) argue, furthermore, that not only is the boxology way of *thinking* favoured in systems development, but also that the

[21] I do not address the developers' knowledge about their *own* work practices here. This knowledge is surely as situated, contextual and rooted in practice as is the users' knowledge about their work practices.

developers themselves (in their case the information systems (IS) analysts) are privileged as a group. To back up their argument they analyse the Information Engineering (IE) process. IE emphasises the need for "strong" and "intensive" user involvement, describing the users as partners and key players in a collaborative development process. However, by deconstructing the description of the IE process, Beath & Orlikowski show that users are persistently described as naïve, parochial[22] and driven by individual or local goals. IS analysts, on the other hand, are described as knowledgeable, professional and driven by corporate goals and therefore they should control user participation. The users need guidance on how to play their role in the process and they require constant control and support in order not to stray too far from the agenda of the development project. The IS analysts do the thinking, tapping into the users knowledge about the business and work practices.

One may argue that the Beath & Orlikowski paper is 10 years old and that IE represents an outdated view of the relations between users and developers. However, similar views are expressed in contemporary systems development approaches. For example, in a paper on Usage-Centered Design, Constantine & Lockwood argue that "user studies can easily confuse what users want with what they truly need" (2002, p. 43). Usage-Centered Design is driven by models which, presumably, have the ability to capture what the users truly need as opposed to what they want. However, as far as I understand it, the modelling is in the hands of the developers, placing them in the position to determine the contents of the models, and thereby to determine what the users truly need. Hence, the *developers* are presumed to be in a *better* position to define the users' needs than the users themselves. In my opinion, this reflects some of the attitude regarding the relationship between users and developers in IE as described by Beath & Orlikowski.

We have come across similar views in our research, and I experienced such attitudes when working as a practitioner. Few people would openly admit to having a condescending attitude towards users, but there are implicit and probably unconscious attitudes towards users that reflect the views described above. They can be seen, for example, in the demand that user representatives should preferably have experience of systems development, that users need to learn the notations used in models or other representations or that user representatives must be "open to changes" – which presumes that users in general are conservative and unwilling to change.

[22] Narrowly restricted in scope or outlook; provincial (www.dictionary.com)

Suchman (1994) argues that the categories[23] we use are political in that they embody and maintain power structures and social order. Öhman Persson (2004) discusses the metaphors or categories we use for describing users, arguing that they are in themselves problematic, since they tend to focus on such factors that are "obvious", e.g. age, background and computer literacy. This categorisation obscures the knowledge that the users have about their work and everyday work practices. Öhman Persson describes a case where the age, gender, background and organisational status (middle-aged women with low level of education and low status) were used as an excuse for not paying attention to the knowledge that the women had about their work. As discussed above, the user concept is problematic in that it may compromise those whose position it was intended to improve, and thereby reinforce the users' lack of power in the development process.

The above discussion suggests that the type of knowledge that can be captured in representations focusing on rationalistic and formal aspects of work is favoured in systems development. These representations do not accommodate the practical knowledge of the users, rather, it becomes obscured and marginalised in the development process. Moreover, it suggests that the developers may be given an advantage over the users, by mere association with a "superior" kind of knowledge that gives them control over the technology and the process. Users, on the other hand, are defined in relation to technology as extensions of it, and in some sense they are seen as being controlled by it.

The way a problem is described or framed determines what solutions are possible (Schön, 1995). There are numerous examples of how poorly designed IT systems interfere with rather than support work practices and the smooth running of a business (see for instance the introduction in this summary; Kuhn, 1996; Eason, 1997). A boxology view of work practices is likely to result in IT systems that cannot accommodate the particularities and contingencies of real-life work practices (Harris & Henderson, 1999; Öhman Persson, 2004).

Having said all this, I would like to point out that it is not a matter of differences in cognitive abilities between developers and users. Users are, of course, fully capable of reasoning about their work in terms of formal aspects. This is what they are often asked to do and learn to do in systems development projects as well as in many other circumstances. My point is that requiring them to reason in this way leads to valuable knowledge about their needs being obscured during the development process.

[23] Here, I refer to Suchman's use of categories as a "fundamental device by which all members of any society constitute their social order." (Suchman, 1994, p. 181), i.e. the concepts or categories we use in our everyday lives to create some kind of social order.

6.4.2 The computer – the epitome of boxology

Boxology serves a purpose in that it takes into account the nature of the computer itself. IT systems are based on computer programs, and computer programming is "…based on the ability to observe and describe regular recurrences." (Winograd & Flores, 1986, p. 64).

Computers[24] can only operate within the constraints of pre-defined rules and conditions.

> Computers can only work in terms of the regularities they have been built to handle. They can only respond based on the way situations fit these pre-defined regularities. They always follow pre-defined rules, and they do not (…) make mistakes. Finally, computers do not change spontaneously, and so they do not require constant management and enforcement of these bureaucratic norms–they obey them automatically.
> (Harris & Henderson, 1999, pp. 89-90)

The developer has to write code based on these rules and conditions. So, somewhere along the line, the "messiness" of work practices has to be transformed into something that the computer can operate on. The design problem must be described by means of formal representations of the properties and relations of the objects that are to be "embodied" in the IT system. The models used in systems development support this need for formal representations (Suchman & Trigg, 1996).

The models are *meaningful* to the developers, in that they support *their* work of turning the design problem into programming code. The models are familiar to them, in that they are part of the social language of IT and computer science. The models facilitate the translation and transition from the design problem to the technical solution, i.e. the computer program, which turns a "wicked" problem (the work practices of the users) into a "tame" or "benign" problem that can be solved with an engineering-oriented approach (Rittel & Webber, 1973). At the same time, the formal representations help maintain the focus on internal quality aspects, e.g. internal error handling, data consistency and performance. These aspects deal with design constraints that originate in the nature of computer technology itself.

One may also argue that the problems with representations that obscure knowledge about the users' work practices is not a problem to the developers. Their objective and mandate is not to develop new work practices for the users but to construct a technical system (Hasu & Engeström, 2000).

[24] I have little knowledge about current developments of artificial intelligence (AI). However, the kind of computer technology used in our partner organisations is not based on leading edge AI which in this context makes a discussion superfluous about whether or not computers can "learn" to operate outside pre-defined rules and conditions.

This suggests that there is a need for translation[25] and transition[26] from the situated and fluid nature of the users' work practices to the zeroes and ones in the computer, making boxology a necessary part of the systems development process.

6.5 Usability work – a fine balance

How does this discussion relate to my research question which asks why usability and users' needs get lost in the development process? In the introduction, I argue that usability in the workplace deals with how well IT systems suit the users' work practices. This means that usability and users' needs are primarily about understanding and designing for the work practices, in relation to organisational goals.

I have argued above that the nature of work and work practices makes them difficult issues in systems development, since they are about integrating a different kind of knowledge, knowledge that is individual, contextual and situated and rooted in practice and skills. This type of knowledge does not fit easily into the representations used in systems development, focusing on formal and intellectual aspects of work (boxology). I have also argued that we cannot do away with boxology, since it is partly based on the nature of computer technology itself. Hence, there is a natural conflict between the need for formal representations on the one hand, and on the other hand, the practical knowledge the users' have about their work.

Usability work is about resolving this conflict. When usability practitioners are introduced into systems development, they "balance" on the dividing line between the need for formal representations in the technology and the fluid and complex nature of the users' work practices. Our studies show that the usability practitioner is often seen as representing the users and their knowledge – as a go-between, having to fit the "unruly" nature of the users' work into the representations used in the development project (paper I). This means that the usability practitioner has to reconcile two ways of thinking about and describing the users' work, ways that are basically incommensurable.

I believe this is one reason why usability and users' needs are so difficult to work with in practical systems development and why these issues are so often marginalised or abandoned. Some of the usability designers we interviewed (paper I) described this "balancing act" when discussing the importance of communication skills:

[25] To render in another language. (www.dictionary.com)
[26] Passage from one form, state, style, or place to another. (www.dictionary.com)

> "…Communication is very important and… there are very often misunderstandings. One forces the users… the users have to write down their requirements, and then situations easily arise where one blames one another. The IT people say 'you didn't say that you wanted this thing', and the users say 'no, but we didn't know that we were supposed to tell you…and we didn't know that we wanted…' – that's where communication ability… to understand what people say or want."

> "Being a communicator. To be able to communicate and reconcile differences, perhaps. You have to be able to argue your case, but also be able to make compromises with others."

Usability metrics has been suggested as a way of safeguarding usability in the systems development process (for instance, ISO/IS 13407, 1999; Mayhew, 1999). ISO 9241-11 (1998) is based on the assumption that usability can be operationalized and measured. Usability metrics may be useful in that the approach places usability on the agenda, the argument being that if usability is included in the requirements specification it cannot be side-stepped and ignored in the project. Specifying usability as a set of well-defined parameters complies with the need for formal representations of the design problem. However, expressing usability as a set of measurable goals obscures the complex and situated nature of work. It presupposes that work can be described by pre-defined operations, which in their turn can be described by sets of numbers. As discussed throughout this thesis, work is much more than simply carrying out sets of operations, it is "… a practice, a set of skills, judgments, behaviors." **(**Wynn, 1991, p. 46**)**.

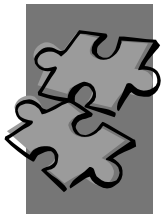
In my experience, usability goals are rarely "out there" to be "captured". Usability goals that are "made up" are not taken seriously and therefore abandoned in the face of approaching deadlines. Moreover, metrics do not provide the kind of data that is sorely needed in the development process – i.e. data that supports the design process in a positive way, moving it forward rather than measuring it and setting it back (papers I and III).

To sum it up, the boxology approach requires that usability and the users' work practices are described as pre-defined operations and steps (and possibly numbers) whereas the fluid nature of the users' work practices defies and eludes such a description. This places the usability practitioner[27] in a dilemma. It is not possible to arrive at the "neat and tidy" models that are required, which may explain why usability is considered "fuzzy" and that the role, responsibilities and position of the usability practitioner are vague and uncertain (papers I and III).

[27] This dilemma is naturally shared by everyone in the project who works with "capturing" and describing the users' needs – use case analysts, requirements engineers, etc. However, I focus on usability practitioners in my research and in this discussion.

However, the problem with usability is not that it is a “fuzzy” concept. Rather the problem is that it attempts to “capture” and operationalize human activity – which is “fuzzy” by nature and basically “un-capturable”.

7. Overview of the thesis



This thesis consists of seven papers, briefly described below. Papers I, II and III describe and discuss usability practitioners, their role, their profession, their practices and their experiences of usability work. Paper IV describes our approach to user-centred systems design. Paper V provides a discussion about some of the factors in systems development that marginalise usability and users' health issues. And finally, papers VI and VII describe a design case.

Paper I: The Lonesome Cowboy – A Study of the Usability Designer Role in Systems Development.
Inger Boivie, Jan Gulliksen and Bengt Göransson.
Description: This paper describes an evaluation of the usability designer role as applied in two Swedish development organisations. We conducted interviews with usability designers, project managers and a user representative in these two organisations. Our main research question was whether or not the introduction of the role had been successful in terms of changes in the development process and impact on products, projects and organisations.
My contribution: I did the major part of the work behind this paper. I conducted all the interviews (together with my supervisor), I did the transcriptions as well as the main part of the analysis work. I was also the main author of the paper.
Publication: Accepted for publication in Interacting with Computers.

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Paper II: Making a Difference – A Survey of the Usability Profession in Sweden.
Jan Gulliksen, Inger Boivie, Jenny Persson, Anders Hektor and Lena Herulf.
Description: This paper reports on a survey of usability practitioners in Sweden conducted in 2003. The survey identified their background and experiences, type of employment and organisation, the systems development process being used and some key success factors for usability work.
My contribution: I took part in all parts of this study, from designing the questionnaire to analysing the outcome and writing the paper.

Publication: In Hyrskykari, A. (Ed.) Proceedings of NordiCHI 2004, ACM Press, 2004, 207-215.

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Paper III: Usability Professionals – Current Practices and Future Development.
Jan Gulliksen, Inger Boivie and Bengt Göransson.
Description: In this paper, we compile and reflect on selected findings in our studies on usability work in practical systems development. We discuss our findings from a practical point of view and relate them to other research done within the international HCI community. Finally, we discuss some issues we consider important for the future development of the practice of usability.
My contribution: I have taken active part in the work behind the paper and in the writing of it.
Publication: Resubmitted to Interacting with Computers, 2005.

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Paper IV: Key Principles for User-Centred Systems Design.
Jan Gulliksen, Bengt Göransson, Inger Boivie, Stefan Blomkvist, Jenny Persson and Åsa Cajander.
Description: In this paper we elaborate on and suggest a definition of user-centred design, or user-centred systems design (UCSD). The definition includes 12 key principles or best practices for the adoption of a user-centred development process. The principles are based on current research and our own experiences from a large number of systems development projects in various domains.
My contribution: I have taken part in writing this paper and in formulating the principles. I primarily contributed with my experiences from working with UCSD as a practitioner.
Publication: Behaviour & Information Technology, 22 (6), (2003), 397-409. http://www.tandf.co.uk

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Paper V: Why Usability Gets Lost or Usability in In-house Software Development.
Inger Boivie, Carl Åborg, Jenny Persson and Mats Löfberg.
Description: This paper reports on a study about what happens to usability and occupational health issues in in-house systems development. The study is based on interviews with developers, usability people and users, about their attitudes towards and practices for integrating usability and users' health concerns into the development process. The main conclusion is that

several factors combine to marginalise usability and occupational health matters.
My contribution: This paper is based on three independent studies, one of which I conducted on my own. A more detailed account of that study is published in Boivie (2001). I was the main author of this paper.
Publication: Interacting with Computers, 15 (4), (2003), 623-639.
http://www.sciencedirect.com/

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Paper VI: Addressing Users' Health Issues in Software Development – An Exploratory Study.
Inger Boivie, Carl Åborg, Jenny Persson and Stefan Blomkvist.
Description: This paper argues for the integration of occupational health issues into systems development. It describes a design case where we addressed the problem of overview and control over the workload in electronic case handling. Poor overview and lack of control are risk factors for stress-related disorders. The main aim of our project was to find methods for involving occupational health experts in the early phases of design and development. We created a prototype where cases were represented by means of a pile metaphor.
My contribution: In cooperation with the other authors, I planned and conducted all parts of the study. The design case was primarily my idea and I was the main initiator in setting up and conducting the study, as well as the main author of the paper.
Publication: Behaviour & Information Technology, 22 (6), (2003), 411-420.
http://www.tandf.co.uk

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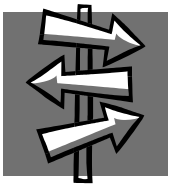
Paper VII: From Piles to Tiles: Designing for Overview and Control in Case Handling Systems.
Stefan Blomkvist, Inger Boivie, Masood Masoodian, and Jenny Persson.
Description: This paper describes a sequel to the study presented in paper VI. It introduces a second prototype, which was designed to incorporate the findings of an evaluation of the piles metaphor prototype. In this second prototype, cases were visualized as "tiles" reflecting the number and complexity of the cases. This paper also describes an evaluation of the tiles prototype.
My contribution: I participated in all the design activities and the evaluation of the tiles prototype. I also took part in writing the paper.
Publication: Conference Proceedings of OZCHI 2004, Ergonomics Society of Australia, 2004, 161-170.

8. Future research



The problems described in this thesis are by no means fully explored. Below, I discuss some issues that I believe require further research in order to realise the potential of IT in the kind of work contexts we have studied – i.e. administrative work, which is primarily knowledge work.

Power

The problems described in this thesis are, naturally, related to the issue of power. Power is central to IT, in that IT systems embody power structures and labour division within an organisation – they are "frozen organisational structures". They prescribe how people should act and interact within the organisation (Suchman, 1994).

However, the issue of power is rarely addressed in practical systems development. There seems to be a belief that IT systems are non-political and neutral, and that inviting users to review documents and criticise prototypes of the future system automatically gives them decision-making power. Unfortunately, this is an illusion in many cases.

Attitudes

The discussion in this thesis suggests the need to address attitudes in systems development – attitudes as expressed in the view of users and their work, and as embodied in the representations, methods and approaches used.

We suggest UCSD as a way of safeguarding usability and the users' needs in systems development, and we base our definition of UCSD on cooperative design (Greenbaum & Kyng, 1991) and other sets of principles for user-centred design (UCD). However, UCSD requires more than the introduction and use of new methods and tools for communicating and interacting with users – it requires a change of attitudes.

Representations and methods in systems development

Many of the representations and methods suggested in cooperative design and UCD, (e.g. prototyping and ethnographic approaches) are time-consuming and their value to the development process is questioned. Systems development typically suffers from tight deadlines that do not allow for extensive field studies or repeated prototyping. Moreover, access to users

is typically problematic and limited (papers I and II). Cooperative design and UCD methods and approaches need to be adapted to the constraints of real-life systems development. At the same time, it is essential that these adaptations do not compromise the view of users as active actors and accomplished practitioners, or the need to focus on the situated nature and complexity of their work practices. The methods and representations must facilitate a shared understanding of the work practices in relation to the new technology.

Organisation of systems development

As discussed above, IT development is often separate from the organisation development process. IT development is organised into separate organisations and projects that have specific time limits - which may hinder communication and a focus on long-term effects of new IT in the workplace. The "deliver and disband" approach to IT development encourages a focus on short-term goals and effects instead.

In this context, I also believe that it is essential to understand the work practices of the developers. Systems development models[28] typically place a strong emphasis on the formal aspects and activities in the *development process*. However, systems development is a social process where people communicate, interact, coordinate their activities, and create meaning. For instance, McChesney and Gallagher (2004) argue that there is a gap between systems development models and the real work practices of the developers in that their work is based on "negotiated order and situated action" (p. 474). The authors furthermore describe informal, tacit work practices in systems development, including extensive use of informal queries. Most development models tend to ignore such situated actions (Nygaard, 1986). Hence, there is a *double fallacy* in the boxology approach in that it obscures important aspects of the work practices of the users as well as those of the developers.

Gender and IT

On a personal level, I am particularly interested in the relationship between IT and gender. Gender is one of the most basic and persistent categorisations we make in understanding ourselves and our surroundings (West and Zimmerman, 1987). It is a categorisation that is never silent, which means that there is virtually no human activity that is "gender neutral". The development and use of IT are emphatically not gender neutral.

Firstly, there is the issue of under-representation of women – primarily in the area of IT development, but also in the use of IT. Much effort has been made to attract and retain women in IT education and IT-related professions.

[28] Models that describe the systems development process.

But, the problems seem to defy most of these efforts and the participation of women in IT has continued to decline.

Secondly, I am interested in the "gendered nature" of systems development (Greenbaum, 1990). Keller (1985) argues that science is gendered:

> "...popular mythology […] casts objectivity, reason, and mind as male, and subjectivity, feeling and nature as female. In this division of emotional and intellectual labor, women have been the guarantors and protectors of the personal, the emotional, the particular, whereas science – the province par excellence of the impersonal, the rational, and the general – has been the preserve of men." (p. 7)

Keller furthermore argues that the concepts of "man" and "woman" underwent a change at the time of the emergence and institutionalisation of modern science. The previous multiplicity of male and female roles was replaced by a polarisation between the two genders, that in the end lead to women being expelled from public life and losing whatever economic, social and political power and options they had had. Women became associated with the home sphere and disassociated with the work sphere. Science, being part of the public sphere, responded to and provided support for this polarisation and has continued to do so since then, despite the objectivity and neutrality of science.

The myth connecting science to masculinity has persisted over the centuries into our days, although the conceptions of male/female have shifted, and the myth is no longer as overtly and blatantly expressed as in the seventeenth and eighteenth centuries. Wennerås and Wold (1997) showed, for instance, that gender was (unwittingly) taken into account in the peer review process of the Swedish Medical Research Council – favouring men over women. There has also been research done about the influence of the male/female mythology in IT showing that it is still "alive and kicking" (e.g. Mörtberg, 1997; Björkman, 2005).

Greenbaum (1990) argues that the systems development process is gendered in that ""Good system design", like "good science" falls on the male side of the [male/female] dichotomy" (p. 11). By focusing on objectivity, detachment, a separation of things and people and of the head and the heart, this "gendering" of systems development shapes the development process, determines the questions that are asked, the methods that are used, as well as the outcome. This gender bias is, for instance, reflected in Information Engineering where the characteristics attributed to the IS analysts (developers) – detached, rational and technically knowledgeable (Beath & Orlikowski, 1994) – are typically associated with masculinity.

I believe that the issue of gender in relation to IT development and use is far more complex than a matter of women being under-represented.

Björkman (2005) suggests, for instance, that the concept of computer science (being an important component in IT) needs to be investigated from a gender perspective, including epistemological issues about knowledge. What does it mean to know computer science and IT?

Acknowledgements

Many thanks to my friend and supervisor Jan Gulliksen for helping me with my research and with my work with this thesis. Thank you for believing in me, for supporting me, and for being the best supervisor I could wish for.

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and civil servants at Skatteverket, the local tax offices and the Swedish National Social Insurance Board (Riksförsäkringsverket-RFV) who kindly shared their time with me to tell me about their work.

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Finally, my love and thanks go to my family, who have supported me and borne patiently with me. Thank you - Bosse, Johannes and Joakim. Without you, this effort would not have been possible.

Summary in Swedish

En svår balansgång: Arbete med användbarhet och användarbehov i utvecklingen av arbetsrelaterade IT-system

Problemet

Många människor använder informationsteknologi (IT) i sitt arbete. Kontorsarbetare tillbringar t.ex. ofta större delen av arbetsdagen framför datorn. I dessa sammanhang blir *användbarheten* i IT-systemen en mycket viktig faktor. Att ett IT-system är användbart innebär att det ger ett bra och ändamålsenligt stöd för användarna i deras arbetsuppgifter, och att de kan arbeta effektivt utan att besväras av problem och krångligheter i systemen.

Användbarhet är en egenskap som uppstår i användningen, men som måste byggas in i systemet under utvecklingen av det. Det är viktigt att fokusera på användarna och deras behov samt användbarhetsfrågor under utvecklingsprocessen. Trots medvetenhet och kunskap om vikten av användbarhet har det visat sig vara svårt att hantera dessa frågor under systemutveckling i praktiken. Tekniska frågor och leveransplaner tar ofta över och styr utvecklingen. Användbarhetsaktiviteter och användar-medverkan prioriteras ner, eller ställs in helt och hållet.

Ytterligare ett problem i sammanhanget är de förändringar i arbetet som uppstår vid införande och användning av nya IT-system. Dessa förändringar uppstår ofta som ett resultat av IT-systemet, vilket innebär att ny teknik driver fram nya arbetssätt på ett sätt som inte alltid är genomtänkt utifrån arbetsmiljöhänsyn.

I min avhandling diskuterar jag hur och varför användbarhetsfrågor och användarnas behov ofta nedprioriteras i systemutveckling.

Forskningsansats

Vår[29] forskning är förankrad i ett arbetslivssammanhang. Vi arbetar med ett antal företag och offentliga organisationer i Sverige. Vårt primära syfte är att studera och förbättra systemutvecklingsprocessen så att de IT-system som byggs i dessa organisationer får god användbarhet och bidrar till en god

[29] "Vår" avser den forskargrupp vid Uppsala Universitet där jag ingår.

arbetsmiljö. Vi har framförallt arbetat med användarcentrerad systemdesign (ACSD), med fokus på metoder, modeller och verktyg för användar-medverkan, design, kommunikation och användbarhetsarbete.

Den forskningsansats vi använder kallas deltagande aktionsforskning. Vi samarbetar med praktiker i våra samarbetsorganisationer, i syfte att överföra den kunskap som finns inom forskningsområdet Människa-dator-interaktion samt att testa och tillämpa den i praktiken. Vi har samarbetat med använd-barhetsexperter, projektledare, m. fl. i utvecklingsprojekt, där vi bidragit med kunskap och stöd till nyckelpersoner. Vi har deltagit i de projekt vi studerat, men huvudsakligen som observatörer, med metodstöd och som diskussionspartners. Med ett fåtal undantag har vi inte deltagit aktivt i termer av operativt arbete i projekten.

Aktionsforskning bygger på idén att forskaren deltar i och studerar en verksamhet i syfte att genomföra förändringar och lösa problem. Forskningen sker i en cykel, där det första steget är inledande studier med syftet att identifiera lämpliga åtgärder. Dessa åtgärder genomförs sedan med mer eller mindre aktivt deltagande från forskarnas sida. Cykeln avslutas genom att forskarna analyserar och reflekterar över resultatet av åtgärderna, samt återför kunskap till verksamheten.

Vår forskning är alltså praktiskt orienterad – den kunskap som vår forskning genererar måste vara tillämpbar i ett praktiskt sammanhang, i vårt fall systemutveckling.

Studierna

Den här avhandlingen består av ett antal artiklar som beskriver den forskning jag, och den forskargrupp jag tillhör, bedrivit.

Mitt fokus har varit att förstå systemutvecklingsprocessen som en social process, d.v.s. en process baserad på människors kommunikation, interaktion, samarbete, etc. Jag har därför huvudsakligen arbetat med kvalitativ forskning, d.v.s. forskning som bygger på insamling och tolkning av t.ex. verbala data från intervjuer och/eller observationer av skeenden. Jag har huvudsakligen undersökt hinder mot användbarhetsarbete och användarmedverkan, och några av de underliggande faktorer som skapar dessa hinder. Jag har fokuserat på hur de personer som arbetar med användbarhet och andra medlemmar i utvecklingsprojekt pratar om och tänker om användbarhet och användarnas behov, samt på hur dessa representeras och kommuniceras i projekten.

Artiklarna i avhandlingen baseras huvudsakligen på halvstrukturerade intervjuer med användbarhetsexperter/-designers, systemutvecklare, projekt-ledare, användare, m.fl. samt observationer av utvecklingsprojekt. Intervjuerna har genomförts med hjälp av intervjuguider med öppna frågor eller teman. Artikel II är dock baserad på en enkät till personer som arbetar med användbarhet i svenska företag och organisationer.

Studierna visar på ett antal faktorer som försvårar arbetet med användbarhet i praktisk systemutveckling:

- **Organisatoriska faktorer**: IT-utvecklingen i de organisationer vi studerat drivs som separata IT-projekt, skilda från verksamhetsutveckling, utveckling av nya arbetssätt och arbete med arbetsmiljö – trots att IT-systemen har stor inverkan på dessa områden. Långsiktiga effekter av nya IT-system – t.ex. arbetsmiljöproblem eller användbarhetsproblem – kan inte hanteras inom ramen för de enskilda projekten eftersom de oftast upplöses i samband med leverans och acceptans.
- **Projekt och projektarbete**: Systemutveckling är en komplex process. Ett stort antal människor ska samarbeta över en längre tidsperiod och man måste ta hänsyn till ett stort antal faktorer där användbarhet är en av många. Ständiga förändringar, t.ex. i kravbild och teknisk plattform, kräver att projektet ständigt måste anpassas till nya förutsättningar. Befintliga projektstyrnings- och utvecklingsmodeller fokuserar på tekniska problem och lösningar samt leveransplaner. "Mänskliga" och organisatoriska frågor försvinner.
- **Användarmedverkan**: Användarmedverkan är viktig för användbarhetsarbetet, vilket många av deltagarna i våra studier instämde i. Trots det fungerar inte alltid användarmedverkan i praktiken. I de projekt vi studerat deltog användarrepresentanterna på heltid över en längre period. De blev snart projektmedlemmar och "IT-arbetare" och förlorade kontakten med arbetet. Studierna visade också på problem med att förstå de "kommunikationsmedel" och designrepresentationer som användes i systemutvecklingen, t.ex. användningsfall.
- **Attityder**: Många av de problem vi sett i vår forskning kan kopplas till attityder om användbarhet, t.ex. att användbarhet enbart handlar om användargränssnittets utformning och hur information presenteras. Detta medför att arbetet med användbarhet begränsas.
  Andra problem som kan kopplas till attityder är att användbarhet uppfattas som "fluffigt" och inte är en naturlig del i systemutvecklingsprocessen. Ansvaret för användbarhet är oklart – de personer vi intervjuade pekade alla på någon annan som ansvarig, t.ex. användbarhetsexperten, användarna, beställaren eller styrgruppen. Trots detta påverkas användbarheten i stort sett av alla i projektet, inte minst utvecklarna.

De användbarhetsexperter/-designers som ingick i våra studier pekar på svårigheterna med att etablera sin roll/position i projekten och i organisationen. De pekade specifikt på vikten av stöd från ledning och projektledning. Trots dessa svårigheter förefaller det som att de, när de väl etablerat sin plats i projektet, har fyllt ett behov. Formella rollbeskrivningar är inte tillräckliga, utan det blir den enskilde individens uppgift att "fylla" rollen med innehåll, d.v.s. kunskap, metoder och aktiviteter.

I artikel IV definierar vi användarcentrerad systemdesign, samt beskriver ett antal grundläggande principer. Att arbeta användarcentrerat är en bra grund för användbarhetsarbete, men inte utan problem. Ett av de problem jag diskuterar i min avhandling är användarbegreppet som sådant. Detta bär med sig implicita föreställningar om användare som passiva och ovana vid datorer. Personer från "användarleden" som deltar i projekt placeras i en roll som representanter för en grupp av "användare" – trots att den roll dessa personer har i organisationen inte handlar om att de är användare av en speciell teknik utan är en yrkesroll, t.ex. handläggare på en myndighet. Man diskuterar deras arbete inte utifrån deras egentliga roll i organisationen utan utifrån deras relation till ett tekniskt system.

Ett annat problem är relationen mellan användarnas behov och organisationens mål och strukturer. Med ett fokus på användarnas arbetssätt finns risken att man tappar bort organisationens mål och strukturer.

Reflektion

Jag avslutar sammanfattningen i min avhandling med att reflektera över en möjlig underliggande förklaring till svårigheterna med att arbeta med användbarhet i systemutveckling.

Jag argumenterar att ett av problemen är det synsätt man har på användarna och deras arbete. Detta synsätt kommer till uttryck i de representationer man använder i systemutveckling, t.ex. olika former av grafiska modeller. Dessa representationer reflekterar ofta ett systemteoretiskt synsätt, där användarna ses som komponenter i ett övergripande system. Deras arbete ses och beskrivs som fördefinierade serier av operationer, utifrån ett databearbetningsperspektiv. Verkligt arbete, å andra sidan, karaktäriseras av att det är situerat, d.v.s. formas av faktorer i situationen. Varje situation är unik, och personen eller personerna i den använder faktorer och omständigheter i situationen som resurser för att lösa det aktuella problemet, t.ex. att hantera en upprörd medborgare på telefon och samtidigt söka information och fatta beslut i hans/hennes ärende. Arbete kan alltså inte förutsägas och föreskrivas fullt ut.

Dessa två olika synsätt på arbete skapar en konflikt i systemutveckling – där informationsteknologin är baserad på att arbete kan förutsägas och beskrivas stegvis på en viss nivå. Datorn kan enbart fungera enligt förutbestämda regler och instruktioner. Användbarhet handlar till stor del om att förena dessa två synsätt, eller snarare att översätta från en situerad arbetssituation till regler och instruktioner som sedan kan översättas till programkod. Denna översättning är svår och kanske t.o.m. omöjlig – eftersom det handlar om att översätta mellan två synsätt som i sig är oförenliga. Personer som arbetar med användbarhet hamnar i klyftan mellan dessa två synsätt, och måste förhålla sig till båda. En inte helt enkel balansgång!

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