Bridging the Gap between Field Studies and Design

IT-Parken, Åbogade 34, Aarhus
Saturday, October 19, 2002
9:00 - 18:00

NordiCHI 2002 Workshop
Aarhus, Denmark, October 19-23, 2002

Organised by

Annelise M. Pejtersen
Morten Hertzum
Peter B. Andersen
Susanne Bødker

NordiCHI 2002 Workshop on "Bridging the Gap between Field Studies and Design"
Organised by Annelise M. Pejtersen, Morten Hertzum, Peter B. Andersen, and Susanne Bødker

Programme

09:00 – 09:30	Welcome and introduction	Annelise M. Pejtersen Morten Hertzum
09:30 – 11:00	Moving from current to imagined practice using forward and backward-chaining	Steve Howard
	Active use of field material in design workshops	Martin Johansson
	Fieldwork for product and system design: two sides of the same coin?	Werner Sperschneider
11:00 – 11:30	Coffee	
11:30 – 13:00	Engaging with the field: the purposeful production of knowledge in system development	Claus Bossen
	Teenage 'phone-talk' and its implications for design	Alex S. Taylor
	Establishing user requirements – a case-study in medical informatics	Hans Andersen
13:00 – 14:00	Lunch	
14:00 – 15:30	Bridging the gap: field research and product design	Anne Cohen Kiel
	Keeping focus on work	Hans Erik Sørensen
	Bridging the gaps, workshop 3 position paper	Anders Mikkelsen
15:30 – 16:00	Coffee	
16:00 – 17:00	Bridging the gap between field studies and design	Anna Carlsson
	Bridging the gap between filed studies and design: a position paper	Steven Robert Harris
17:00 – 18:00	Closing discussion	

Moving from Current to Imagined Practice Using Forward and Backward-Chaining

Steve Howard
Department of Information Systems
The University of Melbourne
Parkville 3052. Australia
showard@unimelb.edu.au

Abstract

Scenarios are often proposed as a means of managing innovation in use-centred design. This position paper discusses how we use scenarios to move from field studies of current practice, to scenario based exploration of imagined future practices. Scenarios allow design spaces to be mapped, both marking and pushing the boundaries of those spaces, and charting paths through the conceptual terrain therein. They achieve this through facilitating two modes of design discourse (forward and backward-chaining), and mapping the granularity of the design conversation.

1. Introduction

In HCI we are beset with contradictions and paradoxes to such an extent one wonders how we get anything done! Let's consider just two.

Our past informs our futures. We face an apparent dilemma captured in the phrase 'use-centred innovation'. Bødker and Christiansen nicely restate this in terms of 'border control'. Designers *"find themselves caught in a dilemma between awareness of tradition and orientation towards transcendence: on the one hand starting out from the praxis and history of users in question, on the other hand making sure that something qualitatively new gets shaped in the process"* (Bødker and Christiansen, 2000). It is this apparent dilemma that we address below, and the role that scenarios may play in pulling us towards the future, in **'forward-chaining'**.

Our futures become our past. Paradoxically, we design for a situation that, in part, our innovations and their use will change in ways that are not altogether predictable. Dahlbom and Ljungberg are pointed in their challenge, *"Why, unless you are a historian, describe in detail a work practice that will soon be replaced due to new technology?"* (Dahlbom and Ljungberg, 1998). Use clearly is not stable. Once we have moved from history to innovation we cannot long be sure that the world we have designed for will remain the world that the user experiences. This is only partly captured by the 'task artefact cycle' (Carroll, Kellogg and Rosson (1991), Howard et al, (2001)) as the issue is not simply that the artefact and task exist in a reciprocal relationship, but also that the user is constantly and actively, if not always deliberately, reformulating the nature of use. It would be more accurate to think in broader terms of deliberate and non-deliberate changes in the interrelationships between the user and their work practice, evolving over time. Our previous work has grappled with the processual nature of use (Carroll et al 2002) and in this paper we address the role that scenarios can play in imposing the future on the present, in understanding the impacts through **'backward-chaining'**.

Before we discuss forward and backward-chaining, a few words about our research methodologies.

2. Research Approach

Our research involves using multiple research methods to establish current practice, and then a variant of scenario based design to move from current practice to imagined future practices.

2.1. Establishing Current Practice

A combination of methods is used to build understanding of current practice (see Carroll et al, 2002):

- Focus groups: in order to access to participants' recollections of their own practice, their interpretations of technology and use. Focus groups also assist in establishing rapport between researchers and participants.
- Questionnaires: At each focus group (many by be required depending on problem and domain) stakeholders completed a demographic questionnaire.
- Scrap books and diaries: Asking users to keep scrapbooks and diaries allows data to be collected about activity that is hard or impossible to observe. Scrapbooks provide access the participants' perceptions, attitudes and understanding. Diaries can be useful in keeping a record of when what and where technology is used.
- Participant observation: Focus groups concentrate on a few issues and a rather researcher led and somewhat artificial. Questionnaires allow us to collect self-report accounts and data. Though scrapbooks and diaries allow access to events difficult to observe, they again rely on self selection and self reporting. Participant observation gives us in-depth access to events that unfold over time in fairly natural settings.

Taken together, the use of such multiple methods provides us with access to group (focus groups) and individual (questionnaire, scrap book, online diary and observation) data, participants' self reports 'after the fact' (focus groups, questionnaire, scrap book, online diary) and our own interpretations of everyday events (participant observation).

2.2. Scenario Based Envisionment of Imagined Practice

We use a variant of scenario based design to move from our empirical analysis discussed above, to the description of future opportunities (see Howard et al, 2002a and 2002b). Our approach can be characterised as follows:

- Rather than walking through scenarios, our scenarios are 'acted out' by professional actors and users. This increases the designers' sense of immersion in the users' world.
- Rather than being text based 'stories' of use, we develop 'contextual scenarios' (bare, skeletal scenarios that describe context rather than information about actors and their goals) that play the role of stage directions for the ongoing acting out. Such contextual scenarios are based on the rich descriptions of current practice that emerge from the use of the multi-method approach presented in the previous section.

Our approach facilitates the co-evolution of the artefact and situation of use. Such co-evolution we argue is facilitated by forward and backward-chaining.

3. Scenarios in Forward and Backward-Chaining

Scenarios fulfil many roles in innovation, including:

- Riding the boundary between 'experience and expectation': A scenario can capture, albeit in fragmented form, both current or intended use and the agreed upon or emerging meanings that a participatory design team hold to at a given point in time. Bødker and Christiansen refer to this role as the 'boundary object". We like to think about moving from experience to expectation as forward-chaining the design discourse, and understanding the implications that those expectations have for current practice as backward-chaining. This issue is considered in the next section.
- Allowing the boundary to be moved in deliberated ways: Once established, a boundary can be manipulated. One's focus may narrow or broaden, for example moving from individual user-technology experience to more broadly examining the entire group. The focus may also shift, for example moving from one user cohort to another. Elsewhere (Howard et al 2002a) we have discussed the use of scenarios in two ways: top down (where freedom in the situation is systematically withdrawn) and bottom up (where the discourse is given increasing freedom during successive iterations of the scenario). This issue is discussed in Howard et al (in press).
- Monitoring the coverage of the space therein: Boundaries contain spaces of design possibilities. Scenarios, like design rationale (Moran and Carroll, 1996), allow a record to be kept of the coverage achieved in any design session. This issue is discussed in Howard et al (in press).

In addition to such 'instrumental' purposes, scenarios provide a shared semantics that is under constant renegotiation within the participatory design team. To support innovation we have found that scenarios should

be vignettes located in space and time but stripped of any detail that might firmly direct the discourse. In reflecting typical work practice (used broadly to include practices related to social activities, leisure etc) they should hold that work practice up to question.

Figure 1 captures the relationship between experience and expectation in terms of two processes. In backward-chaining the impact on current practice is examined from the perspective of some idealised scenario. Constraints may be provided by understanding current practice but the design discourse proceeds so as to 'impose' the design on the current situation of use, thereby exploring the design's impact.

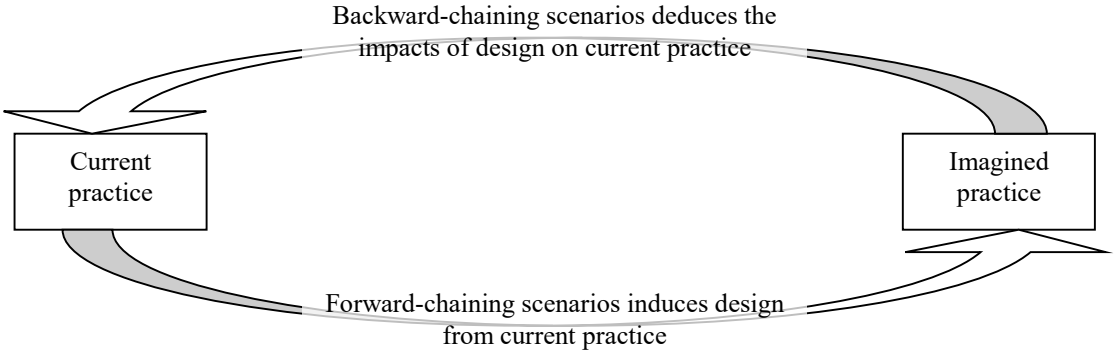


Figure 1 Forward and Backward-Chaining

Forward-chaining moves from an understanding of current practice to imagined future use, grounding the emerging design in the current usage situation. Here constraints are provided directly by current practice, and the design discourse proceeds so as to remove those constraints through design innovation. This is illustrated in the data shown in Episode 1 below where in response to a current problem faced by the actor (purchasing music) a solution was proposed by a member of the design team ("would it be useful to have audio?").

In both modes a 'chain' of constraints (resulting in a series of modified scenarios) connects current and imagined work practice, each link in the chain reflecting either increased knowledge about the design or its likely impact. In practice, backward and forward-chaining are tightly interleaved resulting in design discourse that attempts the co-evolution of an understanding of both current and future use.

What is missing from this account of scenario-based design as chaining is the flavour of estimation and guesswork that characterises the process. Bødker and Christiansen prefer to think of this as abduction. Our own view is that it may productively be seen as creativity and idea generation.

Episode 1

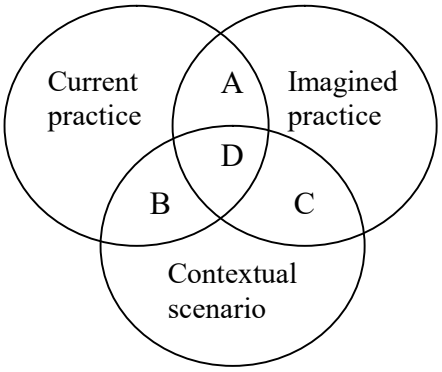
<Actor puts on the watch and stands in silence.
Presses various buttons whilst observing the display. We learn later that button pushing informs the device about budget, time urgency for purchase, requests to visualize what the girlfriend already owns. Takes off the watch and holds it to his heart. We learn also that the device senses what he feels for his girlfriend and on that basis recommends music and location where this can be purchased.
Rotates 90 degrees on the spot and walks off camera.>

D1	*"Take away the buttons. How else could you interact with the device?"*
	<unanswered>
D2	*"You did not choose audio, why?"*
Act	*"So I don't have to speak into it…it doesn't need a speaker."*
D3	*"Given you chose music, would it be useful to have audio?"*
Act	*"I guess so, yeah, yeah!"*

4. Wrapping up

Seeing use-centred innovation as the confluence of push and pull forces, of experience and expectation, of forward and backward-chaining helps us understand the contradictions and dilemmas that beset us. We are caught between honouring current practice and wishing to take flight with any number of imagined futures. Scenarios help us negotiate that tension. Their roles are numerous (see figure 2) but in part they gain their power from allowing us to reason about the preservation of current practice in the revised or imagined practice (A); in assisting in backward-chaining the impact of imagined innovations on current practice (B); in forward-

chaining to imagined practice (C); and in tracking the changes that occur as, during the use-centred design process, current practice becomes future (D).



A Carrying over of current practice into imagined practice
B Discourse about likely impact of imagined practice on current practice
C Discourse about imagined practice
D Contextual scenarios track change from current to imagined practice

Figure 2 Relationship Between Pactice and Contextual Scenarios

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Active use of Field Material in Design Workshops

Martin Johansson
Space and Virtuality studio
Interactive Institute
Beijerskajen 8, 205 06 Malmö, Sweden
+46 40 66 57 222
martin.johansson@interactiveinstitute.se

ABSTRACT
For more than a decade there has been presented numerous reasons why ethnography is relevant for design, little attention, thus, has been given the practical question of how this is to be done. In this position paper I will argue for a design process that has its starting point, and its on going development rooted in field material. Rather than bridging a gap between field studies and design, I suggest a design process that interweaves the ethnographic analysis and the design exploration.

Here I will argue that by using field material (e.g. video) to build and tell design stories, the design process will guide us in how we can use the studies we have carried out. Further more I will suggest a change of roles for the person who has done the field studies. Instead of doing the interpretations of the material and deliver descriptions to designers, preparation of the material so that it is suitable for a design session gets increasingly important and the ethnographer gets a design-facilitating role.

For a three years period I have been involved in several work practice based design projects at the Interactive Institutes Space studio. These projects have involved 'end-users' and other stakeholders, participating in collaborative design processes.

Keywords
Work practice based design, ethnomethodology, ethnography, collaborative design

Introduction
The title of this paper is 'active use of field material' and is pointing at the need of integrating the analytic process of the ethnographer and the construction process of the designer. Ethnomethodologists have successfully developed ways of working with field material, and this approach strives to bring some of these ways into the design process. The ambition is to let the work in the design process to stay close to the field material, striving to adopt an ethnomethodological way of looking at work. As designers one looks at the existing practice for the purpose of change, and what one want to see is the 'seeds of the future'.

Related work
For many years several researchers have dealt with the problem of how to make ethnography inform design, all with the strong belief that knowing about the world is useful when changing it. This paper will not discuss whether this is a valid theme, but will go into the more stringent question of how a design process can be set up to integrate and learn from ethnographic work. It has been within the CSCW (Computer Supported Cooperative Work) community the question of ethnography and design has developed. English sociologists (Hughes, et al 1994) and American anthropologists (Blomberg et al, 1996) have been the leading voices within the community both working with ethnography informed by ethnomethodology. As many others within the 'Scandinavian collaborative design' tradition I have adopted these ways of working (Kensing and Simonsen, 1997., Nilsson et al, 2000., Karasti, 2001., Johansson et al, 2002)

Plowman et al (1995) points out that many researchers have stressed the importance of work practice studies in design, but that the vocabulary used is modest. Terms as 'informed by ethnography' and 'relevance for design' is not saying anything about how it can be done, nothing about how design is informed. Traditionally ethnographers use 'thick descriptions' to describe a practice, without suggesting ways of usage of the description they provide. Despite a large interest in the ethnography-design relation, few concrete ideas in this direction have been presented. One exception is Crabtree (1998, 2001) who suggests one approach making use of stories for design. Recently another direction has won the interest of several researchers in the field, namely the patterns approach first introduced within architecture by Christopher Alexander. This approach is represented here by Martin et al (2001) and takes on the task of creating patterns that is 'families of resemblances' out of concrete instances from work practice studies.

Following Ethnomethodology
The English sociologists, mentioned above, have for many years been offering good arguments for ethnography to inform design, and have been stressing the importance of acknowledging social aspects and the complexity of work

as important input for technology development. They have continued on the Ethnomethodology track laid out by Garfinkel, and states that they do not make any assumptions but only report versions of what has been studied. Ethnomethodologists claim that *everything is out there*, and the only thing they can do, is to give descriptions of existing practices, offering "accounts" of "the actual ways in which work is done" (Blythin et al, 1997). They do not consider themselves as designers, and do not want to give advise on design, but they can tell stories about what they have seen.

From detailed studies done by the English sociologists we have learned a lot about how technology actually is used in praxis, and this knowledge can in my view be of value when developing new technology. Hughes et al (1994) describes this kind of usage of ethnography as 're-examination of previous studies' in contrast to different ways of doing studies for the specific design case. We can learn from it, but we do not come any closer to the context we are designing for. Button and Dourish describes the CSCW ethnography as a critic of technology and wants to see 'how design can productively learn from ethnomethodology'. For the purpose of finding these new ways for ethnomethodology to inform design, they make a theoretical exercise in dividing possible ways of establishing a relationship between ethnomethodology and design (Button and Dourish, 1996). They found three categories: Learning from the ethnomethodologist, Learning from ethnomethodological accounts, and Learning from ethnomethodology. It is the third one 'learning from ethnomethodology' I will elaborate on here. 'This alternative view is less concentrated with what the abstraction (or representation) is, in it self, focusing instead on what it can do and how it can be made to work.' (ibid)

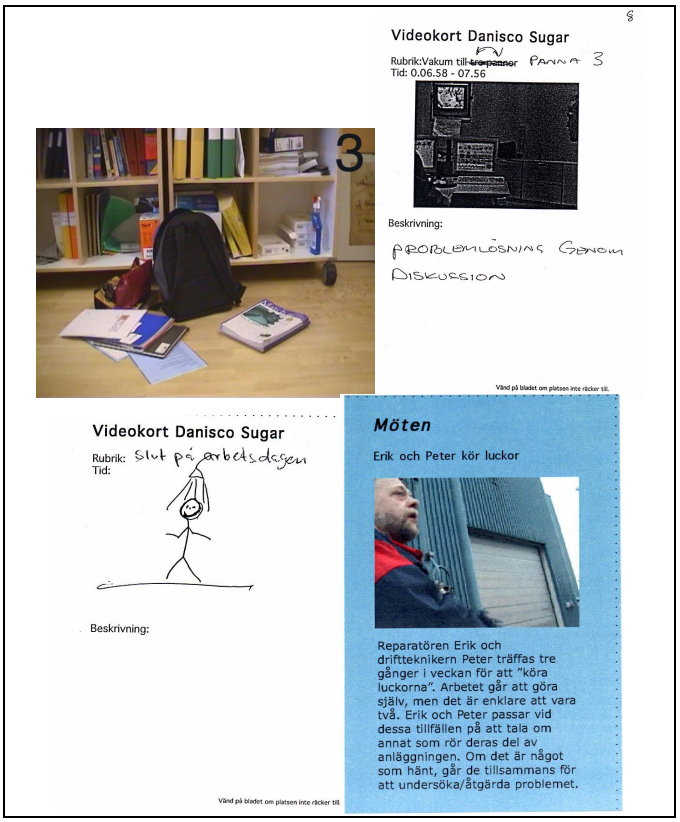
Building blocks

Both the story telling and the pattern approach has in common that they strive to let design be informed by ethnography, and both are making their contribution practical and explicit. The work practice based design that is argued for in this paper has similarities with both, acknowledging the active involvement in the design process, as Crabtree, and thinking of the availability through format as Martin et al. From my perspective this approach would give one possible suggestion to the Learning from ethnomethodology category, which is different from the other from Crabtree (2001) and Martin and colleagues (2001).

The approach that I have been involved in developing is meant for a Collaborative Design setting. It tries to break out of the waterfall model 'looking-understanding-designing' and instead follow a more explorative design process. Nor are we using the field material to find 'hard data' as input to a require specification, but for 'maintaining reference to the context' (Buur et al, 2000). What is acctually done in this way of proceeding is that we have taken one part of the analytic process usally done by ethnographers and brought it into the design process, and made it a collaborative task. The intention is to create a design lab where the participants trainded in ethnography and the participants trained in design collaboratively can go about exploring field material in an integrated process of exploring design possibilities. Here the purpose is not to contribute to the knowledge about any specific work practice, but the exploration is motivated by design and grounding that desing in work practice.

Pictures from workshops, where the cards has been used

More practically the design process that we work within most often starts with some kind of request from an external party, and it typically involves work place studies and ideas about technology from the external party. This approach has in different manifestations been used in many projects during the last few years. What binds it together is that we used sets of tangible paper/plastic cards representing video snippets from the field material, we call this Design Material. The idea with the cards is that they are used to build stories about possible futures. Connected to each card is a video snippet showing an activity and gives a context. The number of cards in the sets has varied between 20-40 cards, and the video snippets are between 40 seconds and two minutes. Our work with video cards is inspired by the Video Card Games (Buur and Søndergaard, 2000), we have borrowed the 'technical' platform, but instead of making up rules of a game we let the design intentions lead the workshop participants in their exploration of the material. The thought is that the participants can use fragments from the studies to build their stories, and while building looking into the pieces in more detail. We let the workshop participants work with the design material as they find it suitable from their competent view. But it is in our case not merely to "play around with the truth" (as for example Gaver et al 1999), but rather to use "true" images of existing practices as "building blocks" for creating visions of the future.



Video Cards from different workshops

In several projects we have worked with different group constalations sometimes with many stakeholders, and at some occations only with the persons that we have followed, the future users (Johansson et al 2002). At one of the pictures above a process operator participating in a workshop have made a drawing and added an activity that that group found important for their story.

A change of roles

In this approach the ethnographers role would rather than being *the* analytic of the team, take on a role of keeping the discussion grounded in the material and make sure that the material is thought about from the perspective of 'the natives' (others can of cause also do this, but the experiences from previous work practice analysis seems to a good resource). This proposes a design process where all the participants take on the roles as designers. The involvement of ethnographers in this process is of crucial value due to their analytic experiences. Or as put by Shapiro "But they [the designers] have no magic means available to them for reconciling orthogonal perspectives or working through the detailed consequences of social scientific studies. It seems odd to impose the entire responsibility for the redesign of the work on systems designers while those whose specialty is supposed to be the analysis of work run for cover." (1994).

Discussion

Technology developers often have strong theories about 'the world' and how things should be done, and these theories are often motivated by efficiency. The sociological pragmatic perspective that the ethnomethodologists have brought to sociology is in my eyes one of the things that we could learn from the ethnomethodologists and apply in way we work with technology development. The role of the design artifacts (e.g. video cards) are that they function as *the* building blocks, and in due to what these building blocks are loaded with, the design team will be confronted by the work practice, all through the design process.

In this paper I have advocated for the *active* use of field material in collaborative design workshops. The material that has been used in this case is video. We could have chosen other means of brining the field study into the design session, but we have not since video has suited our purposes well. Video as a material is very rich, a short snippet can contain several different fragments for a story, it can provide a picture of the context, and mediate feelings, it can show one or many activities, and so on. It is not the aim of this paper to go into detail about how to select video snippets that can become design material, but there might be fruitful to describe some of the thoughts about the material. The basic principle that we have worked with is that the work practice should be highly present in the design work. The context should be obvious, and activities taking place made observable.

In a design session the nature of the design material and the task at hand opens gateways to learning more about the work practice. By using video snippets as building blocks in the exploration of future possibilities, keeps the process in a firm grip by the praxis studied.

Here I have used the categorization borrowed from Button and Dourish (1996) as a theoretical tool to look at differences between different approaches all striving for ethnography to inform design. In practice the categorizations are not isolated ways, most approaches have traces from all three categorizes. Still I think that the categorization can help in seeing differences and similarities between different approaches to work practice based design. From my perspective why we wanted design to be informed by work practice in the first place was the 'grounding in praxis' and what we can learn from ethnography informed by ethnomethodology is ways working as design analytics, breaking normative thoughts and preconceptions about how the world "should" be.

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Fieldwork for Product and System Design: Two Sides of the Same Coin?

Werner Sperschneider
Center for New Ways of Working
University of Aarhus
DK-8200 Aarhus N
+45 8942 5707
werners@daimi.au.dk

Abstract

The discourse on studying work and technology by means of ethnographic fieldwork has lead ethnography to become a method *de rigueur*. The ideas and orientations promulgated by Lucy Suchman and others developed into a design *lingua franca* (Anderson 1997). Ethnography has been set loose in the design collaboratorium (Bødker/Buur 2001).

However, designers have been interested more in fieldwork than in ethnography. Ethnographers in design feel to compromise their discipline: on the one hand they hardly can live up to the conceptions of traditional ethnographic fieldwork methodology. On the other hand they try hard living up to demands of the new field.

With this position paper I would I like to argue that this is to the disadvantage of design. My attempt is to reflect on the same practice (doing fieldwork) in different fields (product design and system design) and to mirror the practice of fieldwork in the conceptual framework of a new emerging field, that of a design anthropology.

What is *ethnographic* in studying the field?

Ethnographers mains task in both domains often is to describe work activities, task priorities and environments of use. The notion of *ethnography field study* has gained increasing interest during the last years in areas like information systems design, participatory design, user centred design, computer supported cooperative work, and various other sub-domains of human computer interaction. Doing ethnographic inquiries is regarded as being fundamental to most design. But referred to are mostly issues of ethnomethodology rather than ethnography according to the conventions of the more original fields of studies in anthropology. What unifies all ethnographically inspired approaches in system design is the idea of doing ethnographic fieldwork first.

Ethnography came into system design via ethnomethodology[1]. Ethnomethodology is associated with the work of sociologist H. Garfinkel. Ethnomethodology has drawn from both sociology and anthropology. The most notable achievements in ethnomethodology have been in the field of conversational analysis. Ethnomethodology sees the goals of social actors as central, and studies the manner in which speech and social organisation emerge from social interaction. Ethnomethodology studies the methods by which actors come to understand and produce structures of social interaction. Thus ethnomethodology has drawn from anthropology the method of ethnography to achieve its goals.

But ethnography is also identified as a category of social and cultural anthropology[2].. In anthropology ethnography is characterised by the first-hand study of a small community or ethnic group. Ethnographic studies combine descriptive and analytical elements. The central characteristic of ethnographies is that they consider theoretical or comparative generalisations from the standpoint of

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[1] The remarks on the distinction between ethnomethodology and ethnography are drawn form Seymour-Smith (1986).

[2] British social anthropology sought to underline aspects of society, social structure, and social organisation. American cultural anthropology in the narrowest sense is restricted to the concept of culture, but it includes prehistoric archaeology and anthropological linguistics as well as the comparative study of human cultures and societies. See Seymour-Smith (1986).

the ethnographic example. In anthropology the term is used distinctively with two meanings: ethnographic research (fieldwork), and ethnographic monograph (as a particular writing style in ethnography).

Writing fieldwork

Traditional ethnography is regarded as the understanding of another persons situation by means of participation and observation. Ethnographic fieldwork is about getting to grips with "what people employ to interpret and act on the world, feelings as well as thoughts, embodied skills as well as taxonomies and other verbal modes" (Barth 1995:66). The basic attempt in traditional fieldwork is to observe life as it unfolds, that is observation in natural environments. The ethnographer's task then is to argue from the native's point of view, thus the interpretation becoming a mere representation, if not a fiction (Geertz 1973:15).

Correspondingly in all user centred design the ethnographer is expected to give voice to the users viewpoint. This tells me the lesson I learned during a 3-years practice for a major Danish manufacturer developing industrial products.

Postmodernist critique in anthropology (Clifford/Marcus 1986, Marcus/Fischer 1986) opened up for a discourse on textual authority that argued for the disappearance of the author, thus giving place for informants inscriptions in the text. These developments opened for our understanding of human societies through the intimacies of "local knowledge" (Geertz 1993).

In design this helped to diminish the impetus of the authorial designer's gifted creativity. Retrospectively we saw the emergence of a participatory approach (Floyd 1989, Bødker 1991) favouring the recognition of user's voices in the design process. Participatory design is understood as the direct collaboration between designers and users. It is a conceptual approach that incorporates complementary perspectives to help designers come up with better solutions (Kyng/Mathiassen, 1997). Ever since actions, and voices, those of the ethnographer and those of the informant/user, are regarded as situated (Suchman 1987). The question then that comes about is: Do we? Do we really take account of the situatedness of all fieldwork? Do we really do enough to consider local knowledge while struggling with the constraints we are exposed to? Or do we just pay lip service?

Fieldwork for product design

At the turn of the millennium the Danfoss Company, a major Danish industrial manufacturer for refrigeration, heating and motion controls, became interested in making its catalogues, and related sales material electronically available. The challenge for designing a system across all products was to seek information about how to employ electronic devices for user manuals and instructions, possibly handheld, and ubiquitous. The question was: What could a possible future information system look like?

To explore the potential of using electronic media, current use and recent production of existing technical literature was studied. Research activities and testing prototype concepts ran in parallel to prompt user opinions. Research started out with observing work, and interviewing users. Field research was exclusively conducted with a video camcorder. Video transcripts and field notes were carefully examined to identify common topics and general interaction patterns.

For the field study users were asked to carry out their planned duties, while a log of their activities during the course of the day was kept. If possible the field technique of 'shadowing' informants was employed: Users were followed in their daily routine. A recorded of what occurred was made, e.g. a sudden troubleshooting situation. This technique aimed at following the ethnographic ideal of participant observation.

At the end of a day, people were interviewed to ensure a complete log of all activities, e.g. on the nature of the activities carried out, how long these activities normally take, and the kinds of documents and document-related tools they used. Field observations were intended with the objective to identify generally reoccurring familiar situations that could help defining patterns of interaction with paper manuals. The patterns than made up the basis for designing scenarios for prototypes.

Fieldwork for system design

By the turn of the millennium the Aarhus County Construction and Energy Consumption Office had come to realise that it needed better understanding of its own work practices, its culture of work, if it was to employ new political directives, e.g. to make more effectively use of new information technologies. At the same time, the Center for New Ways of Working was seeking a case study for instigating information technology in a contemporary organisation. Interests then coincided. Questions of research concerned:
a) the social and technological challenges for mobile and flexible work for interaction in both shared and distributed physical environments, e.g. stationary at the office desk, *nomadic* on a customers premise, mobile in a car or remote at home;
b) the implementation of mobile and spatial technologies for supporting *nomadic* work.

Ethnographic observations of work and technology served to establish a common understanding of work situations, work context, use of artefacts and tasks. This was done with a special focus on the construction and maintenance of conventions and mutual understandings used in interaction in both shared and distributed physical environments. The design focused on how to support mobile and nomadic work of architects and engineers.

Although this research is not finished yet, the intention is to turn ethnographic field observations into scenarios for the application of "intelligent" technology. There is hope that scenarios thus serve to pin-point to potential problems with "intelligent" technology in shared and distributed work environments.

Conclusion

Fieldwork for product design builds on what is there, on existing practice. Product design triggers new ways of interaction with products. Fieldwork for system design goes far beyond user's imagination. System design appeals much to the authorial creativity of the genius designer, which the situated approach once intended to leave behind. System design strives far beyond current use. System design causes a new practice, not only a new way of working, but a new way of social interaction. It is technology that is in the way. Designing new systems leads to new ways of how humans interact, not only with technology, but with each other via technology, e.g. the SMS revolution. In this sense system design transcribes the very essence of social intervention.

In my field research on how to support architects and engineers with new mobile and spatial information technology I came to realise that the design won't just create new products, but we will change ways of interaction, not only of interaction with technology but of interaction with people. We'll do more than changing ways of working. We'll come to influence social interaction.

Krippendorff (1989) stated that "Design is making sense of things". Well, I suspect that design does more than that. Design is social intervention. If ethnographic fieldwork serves as the basis for social intervention, than we need to regard the field as a site for strategic intervention. Field studies than is more then collecting data.

I am not intending to say that fieldwork in system design can be slippery basis for the design. I simply would like to point out that we should be aware of invisible processes and their possible results for interpretative processes, now embedded in technology and thus hard to access and to envisage for others.

In this sense I would like to suggest a design anthropology that has a double perspective: Design anthropology is a bricolage of anthropological and design perspectives, a merging of the users' perspective and the designers' perspective. It is a balanced mingling of insider and outsider points of view. Design anthropologists would use ethnography and other related methods to address a range of issues for the design of technical systems in order to meet human needs. They recognise that field knowledge is far more useful when it incorporates information on socio-cultural as well as technical change. Design Anthropology is a field that is neither shaped yet, nor is any analytical or conceptual framework drawn.

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ENGAGING WITH THE FIELD: THE PURPOSEFUL PRODUCTION OF KNOWLEDGE IN SYSTEM DEVELOPMENT

By Claus Bossen

Position paper for Workshop 3: Bridging the Gap between Field Studies and Design, NordiCHI'02, 19th -20th of October 2002, Aarhus, Denmark

The relationship between field studies and design is, I think, about producing knowledge for a purpose and sharing it. At the broadest level, knowledge can take different forms and, e.g., be embodied, emotional, visualized or verbalized. Depending on purpose different forms of knowledge may be more appropriate than others: music and poems may be good for conveying emotions, while language is good for categorization. Because knowledge has different forms sharing it is not a trivial matter, since one kind of knowledge might have to be transformed into another in another: the translation of emotion to poem to music to philosophical investigation implies loosing and gaining something in the process. Even within verbalized knowledge there are different ways of producing knowledge and assessing its value, of which the different styles of writing give ample evidence. Neither within verbalized knowledge is sharing it trivial, since for example poems, novels and discursive arguments are different forms of writing to which a variety of criteria of evaluation are applied. Some forms are better for some purposes depending on whether it is conveyance of beauty, depiction of social life, logical reasoning that is the aim. Also within the sciences, we produce, through different methodologies and modes of argument, different kinds of knowledge that we evaluate according to different criteria.

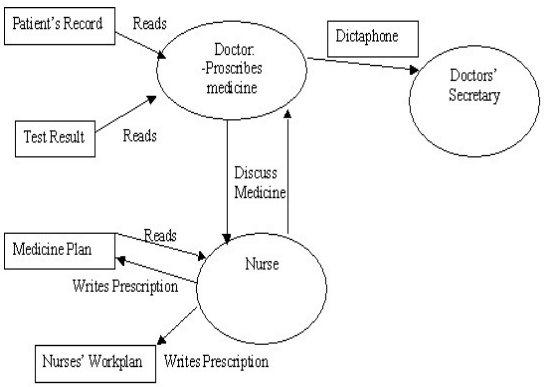
While these introductory remarks may seem rather elusive, their framing of this paper should hopefully become clear when I address the relationship between the field of people's everyday life and work and design below (I will use 'design' and 'system development' as interchangeable terms). My argument is that we will have to live with a variety of different kinds of knowledge and ways of sharing it and that 'field studies' is just one way of engaging with people. There is no single way in which 'the field' relates or should relate to design. The step forward in system development with regards to this issue to accept the heterogeneity of the field, be more reflexive about which kind of knowledge production is appropriate for which project and heighten the awareness about which kind criteria for truth applies to different ways of producing knowledge. The perspective will be that of an ethnographer who has been in the field of system development and design for two years, and I hope the main points will have more general relevance. I will start by a short story about an initial ethnographic field work in a computer firm, and use this as the basis for a discussion of different kinds of knowledge-production within HCI and CSCW, which leads to the conclusion.

Field-studies via ethnographic toolkit: the case of Contextual Design

In the spring of 2000, I made my first excursion into the landscape of system development, when I followed the field trips and subsequent follow-up sessions of a team from a computer firm that was to develop an electronic medicine scheme for a county in Denmark. These field visits formed the first, 'information gathering'-phase of the development process, whose second part was a 'vision'-phase that was to lead the requirements specification and the signing of the commercial contract between the firm and the county. The firm had little previous experience with user-involvement, since it previously had made 'black-box' products with little or no user-interface, but felt domain knowledge and engagement with people from the hospital to be required for this project. Accordingly, the team adopted the 'Contextual Inquiry'-method as described by (Holtzblatt and Jones 1993)and. (Holtzblatt and Beyer 1998) Briefly stated, Contextual Design proclaims itself a 'customer-centered' approach with emphasis on making interviews with users while they are engaged in their work. It provides five graphic models of work (i.e. models of sequence of work, artifacts employed, work-place culture, physical space and work-flows) through which to order experiences and information and present them inside and outside the team. One of the firm's computer scientists knew Contextual Design from his graduate studies, while another had attended a course by Holtzblatt herself. These two then arranged for a two-day course for the rest of the people

in the development team which was subsequently sent off to the hospital departments. All in all, 7 developers conducted 18 field trips at three hospitals and the central hospital pharmacy during three weeks. During these fieldtrips the developers (including a nurse) conducted interviews with a clinician - a nurse, doctor or pharmacist - whom they followed around during work at their respective wards. The subsequent day was used for follow-up, just as Contextual Design proscribed, and here each developer spent the first 2 to 3 hours individually writing up the observations from the preceding day in prose as well as representing them in on or more of the work models of Contextual Design (See the figure below: Flow model of prescription of medicine). Thereafter, the whole team met and spent the next 3 to 4 hours presenting their work models to the rest of the time. These sessions were modeled rather closely to the roles and ways of the interpretation sessions described in Contextual Design. The 3-week information-gathering period, were one day's of field trip was follow by one day of following up, was concluded with a one-day meeting between the developing team and a group of doctors, nurses, doctor's secretaries and pharmacists. Here the team presented their findings via general work models of e.g. a doctor's prescription of medicine, a nurse's giving of medicine or a pharmacist's ordering of new stock. The team of developers continued to have contact with a group of nurses and doctors through six more workshops over the next year, but here I would like just to focus on this first phase of information gathering.

The system developers involved were very satisfied with Contextual Inquiry, because it gave them first-hand experience of the hospital domain, a means through which to systematize their notes and ensured a considerable degree of knowledge sharing through the communal follow-up sessions. The observing and partly participating ethnographer, i.e. this author, can only support the system developers in this assessment. On the other hand, I had at that time two reservations of which the first is appropriate, while the second is not. The first, appropriate reservation concerns Contextual Design itself: it is arguable more 'systems-developer'- than user-centered, since the former appear to be the only persons capable of getting to the truth of work; it has a rather naïve perception of which kind of "true partnership" can evolve between a designer and an end-user within a few hours; and, finally, it ignores questions of power and difference of interests, which are certain to become pertinent in any system development and subsequent implementation, by regarding power as a sub-aspect of culture. (See also Bannon 1994; Bossen 2002) In practice these short-comings of Contextual Design were, as far as I can judge, to some extent overcome by the long-term engagement of the team with a group of nurses and doctors through 6 further workshops and by the fact that they were well aware of differing interests and positions of power. They were capable 'lay sociologists'. (Sharrock and Button 1997) The second, inappropriate reservation concerns the value an ethnographer would give to the kind of information that can be produced by such kind of quickly gathered, under-analyzed knowledge based on superficial acquaintance with 'end-users'. However, while the firm's 'information-gathering' phase did not comply with the ethnographic criteria of long-term fieldwork and subsequent analysis of data, theory and methodology, these criteria are might not be relevant here. The knowledge for produced for a purpose and apparently served that purpose. Ethnography is one style of inquiry, whereas gathering of domain-knowledge is another and therefore quite different criteria of evaluation apply. Tool-kits like Contextual Design or other kinds of 'quick and dirty'-ethnography (Hughes, King et al. 1994; Millen 2000) may be just the right tool for the job in system development.

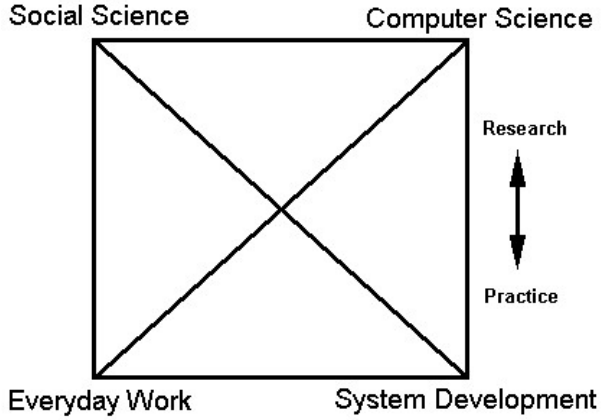


Contextual Design delivered three essentials to the team's system development: a method for getting experience with and information upon a domain; a method of knowledge sharing amongst the development team; and, finally, a way of ordering and presenting this knowledge to each other and outsiders. In addition, the team was exposed to the hectic work of nurses and doctors and to

cancer patients getting cytostatica. None of this is exclusive to Contextual Design, though the concept has successfully achieved to package and sell itself as a ready-to-use toolkit.

The knowledge fields of system development

The purposeful production and sharing of knowledge(s) (for the remainder of this paper, I will leave out the (s), but it is still there) can within design or system development be seen to be spanned out between four groups of people or social fields (See figure). On the one hand, knowledge is produced and shared for the purpose of research by social and computer scientists, while on the other hand such knowledge is derived from and shared with people (also called 'users' (by designers) and 'informants' (by ethnographers)) engaged in their everyday work and life as well as with designers developing new systems (see figure).



This constellation of groups of people owes its emergence to the experience by designers that it takes more than formal verification and logical coherence to produce computer systems, which are usable and useful for everyday work and life. (For overviews, see e.g. Bannon 1991; Bannon 1997; Karasti 2001; Rogers 2001) More than two decades ago, system developers became interested in knowing and knowing about people and their social relationships. The result has been a broad variety of approaches through which to interact with people as future 'end-users', especially within the participatory design movement and collaborative design. (Greenbaum and Kyng 1991; Kensing and Blomberg 1998) To facilitate direct cooperation between system developers and users and end-users a variety of means has been applied: future workshops, (e.g. Kensing and Madsen 1991) scenarios, (e.g. Bødker and Christiansen 1997) vision workshops, mock-ups, (Kyng 1988) video, card-games, probes, props, etc.. Whereas these methods in the participatory movement are used to achieve a strong sharing of aspirations and of knowledge upon basic assumptions, work and work context, (e.g. Bødker and Grønbæk 1991; Greenbaum and Kyng 1991) other designers see them as methods to ensure that products are user-friendly or just to generate ideas. A bit later, system developers began more or less partially to embrace different kinds of social sciences and to include psychologists and later ethnographers into system development in different ways. (see e.g. Hughes, King et al. 1994) The result has amongst other things the formation of new areas of investigation such as Human-Computer Interaction (HCI) and Computer-Supported Cooperative Work (CSCW). Whether HCI and CSCW constitute new fields of knowledge is open for dispute, since it may or may not be argued that they are rather umbrella terms for a heterogeneity of knowledge**s**. They may or may not be ***multi***disciplinary effort**s** within ambiguous cover term**s**, rather than ***inter***disciplinary research into a common substance matter. (Bannon 1997) As of yet these problems have not become pertinent, since the development of the fields have been driven by the practical concern of making system development better.

Naturally, while collaboration between the different disciplines has been fruitful, it has not been without some conflicts. Taking ethnography as a case, system developers lament that it is too time-consuming, too detailed, and fails to make general recommendations, (e.g. Rogers 2001) while the ethnographers themselves are not very good at presenting their analysis or making them relevant to design. (Bannon 1997) Ethnographers on the other hand, feel their work is made reduced to common sense, (Forsyth 1999) stripped down (Wagner 1997)and the analytic potentials neglected. (Anderson 1994) They would argue that it is the detail that reveals what is really required by a system and that design guided by the general only produces mediocre results. Furthermore, while making interviews and noting down observations can be learned rather easily, the analysis and construction of an overview is quiet a different matter. (Bannon and Bødker 1997; Nardi 1997; Forsyth 1999) Finally, some kinds of knowledge and insights can only be achieved through long-

time engagement with ‘users’/’informants’, because of matters of privacy and secrecy and because it takes time to discover invisible work. (Blomberg, Suchman et al. 1997)

Basically then, ethnography has been drawn into system development in two ways: firstly, they have provided methodologies and theories through which to produce knowledge about everyday life and work, and, secondly, they have provided experts in doing the same thing. Neither option is ideal. Whereas designers who use a social science tool-kit gain the benefit of having first hand experience of the field and avoid having an intermediary between them and their users, they loose the kind of detailed, analyzed knowledge that ethnography would produce. On the other hand, the use of ethnographers is time-consuming and may result in the production of knowledge that satisfies the purpose and criteria of that discipline, but not the concerns of the system developers. The choice is between direct or mediated engagement. Some see a solution in the creation of a new discipline that transgresses old borders: (Button and Dourish 1996)propose a ‘technomethodology’ that can “..design novel technological solutions based on an analytical perspective with a specific orientation towards the existing detail of practical action.". (Button and Dourish 1996:p10) Others reject such a solution as misunderstood and impossible because the epistemological differences between disciplines are incommensurable. (Bannon 1997; Taylor, Gurd et al. 1997; McCarthy 2000) Some see a solution in providing better tool-kits for practicing system developers, (Hughes, O'Brien et al. 1997; Rogers 2001) while others see a solution in more collaboration between system developers, users and social scientists. (Rogers 1997)

I think that we should do it all: direct engagement produces a very valuable kind of knowledge about the field for designers and about system development for users and if it develops into shared aspirations it is even better; good social science tool-kits can be of high value because system developers and users are often good at using them; expert handling of methodology, analysis and theory can provide reflections that can inform engagement and possible provide better tools; collaboration between all groups in system development entails a general sharing of knowledge and awareness of differences, etc..

Purposeful production and sharing of knowledge: a conclusion

Neither from the above case of Contextual Design, nor from the exposition of the knowledge fields of system development should the conclusion be that any mode of production of knowledge is as good as any other, since knowledge and the criteria by which we can assess its value depend on the purpose and methods of its production. Knowledge and methodology by which it is produced has to be appropriate to the purpose. Generating ideas does not require long-time field work and intimate, detailed knowledge about people, whereas producing a useable, useful and emancipatory product does.

Nor should the conclusion be that there is no point in reflecting upon and analysis of the fields of knowledge of system development, since the weaknesses of tool-kits such as Contextual Design will be overcome by the practice of the ‘lay sociologists’ of the computer firms, and since the incompability of disciplines within HCI and CSCW has not (yet?) led to dissolvement of these practice-driven fields. We are bound to live with heterogeneity outlined above and have to find the right tool for the job from project. We can however improve our choices by acknowledging that here are different ways of producing knowledge and reflect upon how, by whom, through which means and for what purpose a representation of everyday life and work is made. By being aware of the different kinds of knowledge and their particular strengths and weaknesses, we can make informed choices and reflexively engage in our fields of everyday life and work & of system development.

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Teenage 'Phone-talk' and its Implications for Design

Alex S. Taylor
Digital World Research Centre
University of Surrey
Guildford, Surrey GU2 7XH
+44 (0)1483 295446
alexander.taylor@surrey.ac.uk

ABSTRACT

This paper demonstrates how the fine-grained analysis of conversational talk and face-to-face interactions can be incorporated into the activity theory framework and subsequently used to elicit design suggestions. The research draws on field study data of teenage mobile phone users. The work has two main contributions. First, it shows that rich and detailed qualitative descriptions of computer-mediated activity can contribute to the project of design. Second, it provides a practical example of the role activity theory can play in bridging the divide between field studies and design.

INTRODUCTION

Field studies following an ethnographic tradition have, for some time, been presented as a means to get at the complexity of technology-mediated, social activity [14]. However, there continues to be some debate over the ways in which such studies might inform design [1,10]. The conceptual framework, *activity theory* (AT), has been presented as one possible solution to bridge the apparent divide between field studies and design [12,16].

Although several authors have made efforts to use AT to depict techno-centric work settings and, in particular, their development [5,9,11], there remains no definitive way of using the framework to elicit design suggestions [15]. The suggestions that have been made revolve around altering the nature of field study research so that it is more in line with AT's conceptual underpinnings [4]. This approach is, without doubt, a workable one, offering a coherent theoretical structure to design practice. However, it is unlikely to be a final solution as it necessitates that, at least to some extent, field study researchers give up their own systems of practice.

This position paper introduces work that explores AT's role in using field study data that originates from forms of analyses with their own tradition. Rather than attempt to prescribe a reformulation of the practice of field study investigations, it examines the extent to which AT is able to incorporate field study findings into its structures and use these to inform design.

FIELD STUDY

The presented research makes use of data collected from a field study of mobile phone use amongst teenagers. The fieldwork took place at a sixth form college located in an English suburban town. A familiar part of the English education system, sixth-form colleges are institutions in which students between the ages of 16 to 19 are taught for two years in preparation for their advanced level examinations that qualify them for entry into university. Run over a four-month period, and consistent with the general trends in ethnographic research, the study employed various qualitative procedures, including observational and interview techniques. This resulted in a substantial collection of both observational field notes and group interview transcripts.

Analytical orientations

Drawing on methods for examining talk, the reported research examined the face-to-face interactions between teenage mobile phone users. A conversation analytic orientation, based on works by Sacks [13], was used to inform the analysis, and use was also made of both Goffman's [6,7] and Goodwin's [8] observations on gestures and postures in talk.

The results of this analysis have been systematically modelled using a framework based on AT. The framework draws heavily on Engeström's [3] representation of the 'activity system' in which motive-driven activities are shown to be mediated by mental, physical and social artefacts—such as language, computer-based tools and social norms and roles. It also uses the notions of *contradiction* and *breakdown*, detailed by Engeström [3] and Bødker [2], and more recently by Turner and Turner [15,16].

Analysis of conversational talk

The analysis of teenagers' talk about and with their phones revealed that teenagers sometimes use the mobile phone to order to their everyday, face-to-face conversations. Specifically, it was found that, amongst teenagers, talk about the phone, or more generally '*phone talk*', is routinely used in the management of a conversation's *topic* and the organisation of *participation status*. Of particular interest in this paper is the manner in which these features are occasionally drawn on to participate in covert forms of talk that can be seen to subvert the ongoing course of a conversation.

Topic

The findings from the field study indicated that the mobile phone and, in particular, reference made to it as a tangible object, offers a resource that teenagers call upon to collectively manage the topic of talk. The teenagers who were observed and interviewed appeared to regularly use the phone to order their talk with those around them and, specifically, to start-up or change the topic of their conversations. A great deal of this conversational 'work' seemed to rely on the use of the phone's material presence in talk and its apparent value as a topic in its own right.

Numerous examples in the data, for example, revealed that attention could be turned towards the phone during talk by, for instance, making reference to one of its features or to the content of a text message. As such, phone-talk was seen to be a wholly observable, yet taken for granted, 'device' through which topic is routinely managed. Being always at-hand and its very 'taken-for-grantedness' seemed to be what made the phone a likely topic of talk.

Participation Status

As well as possessing qualities that help to manage a conversation's topic, the field data also suggested that

the phone has its part to play in managing and organising *participation status* in local talk. It was apparent from the data that when the mobile phone is present in conversations between teenagers, it can determine who becomes engaged in talk and the conversational roles that are taken.

Several instances were recorded, for example, of teenagers establishing small conversational interchanges by way of the phone in which other bystanders were excluded. The phone would be picked up and handled to draw conversants together and small groups would huddle together often around a phone. From these instances, it appeared that the phone provided a legitimate reason to manage participation status, not only through its presence in occasioned talk, but also because of its particular physical characteristics. In particular, the phone's size provided a means for phone users to manage the statuses made available to those present in a situation.

Covert, subversive talk

Over the course of the fieldwork it became apparent that the management and organization of topic and participation status by way of the phone allowed teenagers to participate in what was thought to be 'covert' talk that undermined or 'subverted' the course of a conversation and the socially constituted order of an occasion. Teenagers appeared to use the phone to initiate a sub-topic of conversation. This could result in the members of a group being excluded from the conversational exchange. This might happen for example between a group of teenagers sat at a table in the college canteen. The separate topical talk about the phone between two or three at the table would separate them from the other group members.

Occasionally, this shift in topic and management of participation status was used to conceal the content of talk from excluded group members. The exchange would be covertly undertaken through the use of the phone. For instance, gossip exchanged between the select members of a group might be concealed by what appeared to be talk about a text message. By playing on the ambiguity of phone use, the talk served to be 'subversive' in so far as the forms of covert talk served to countermine the recognized order of an occasion. Thus, talk through a phone in class could be a demonstrable display of subversion against 'classroom-order' or the concealed talk by way of the phone between friends could subvert the orderly progress of a wider conversation between a larger group. This view depicts the subversive act as a concealed, locally assembled and produced resistance against an established set of social structures or 'rules' appropriate to a particular occasion.

ACTIVITY THEORY

This descriptive interpretation offers some interesting insights into teenage phone use. It reveals that phones are not purely used as a means to communicate with those who are in physically separate (i.e., remote) locations. It shows that teenagers, in particular, use their phones to mediate local social encounters. This use of the phone, however, is not something that is immediately obvious or something that can be explained simply by considering the phone's design.

This section will demonstrate how AT can be used to interpret the findings described. It explains, at least in part, how phones have come to be used in localised forms of subversion amongst teenagers.

Mediated actions

With respect to AT, the mobile phone can be seen as a mediating tool or artefact. From a traditional standpoint, the mobile phone serves to mediate communicative actions between a subject and his or her community that are remotely distributed. This conventional view is not, however, consistent with the presented findings.

For teenagers, mobile phones are shown to be, on occasions, tools for mediating face-to-face talk and, specifically, the management of topic and participant status. At this level, it is the physical and interactive features of the phone that play a mediating role. These features dictate how topic and participant status can be managed and the social roles that come into play in doing so. For example, the phone's at-handedness and presence in talk allow it to be a legitimate topic of talk and its size influences how many people and who (according to proximity) is able to attend to its content. Using Engeström's well-documented notation, this is presented graphically below. (Fig. 1)

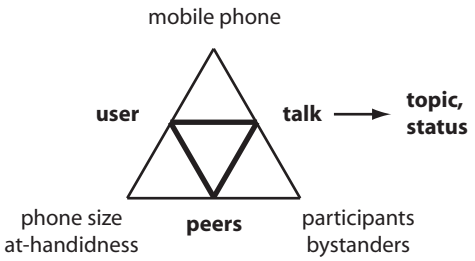

Figure 1. Phone-mediated conversational talk.

Activity Systems

Presumably, as phone use amongst teenagers has developed, these actions have come to be incorporated into what is termed in AT higher-level *activity systems* that are culturally and socially evolved. The findings suggest that one activity system that may have been invoked by teenagers and their use of phones in conversational talk is that of subversion: in particular, locally subversive talk.

This activity system has its own pre-existing rules, norms and social roles. Socially sanctioned rules dictate how 'resistance' can be legitimately performed and made demonstrable. The division between the 'subversives' and those who sustain the order of an occasion is also cast (Fig. 2).

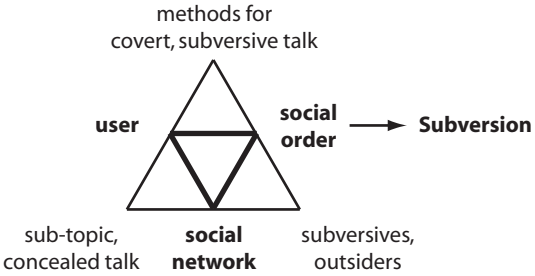

Figure 2. Locally subversive talk.

It is this incorporation into a higher-level activity system that, at least partially, explains why teenagers understand the phone to be more than merely a tool for distributed communication. By invoking this system, phone talk and the mobile phone come to be 'coloured' by the culturally constituted elements of subversive talk. Thus, the actions of managing topic and participation status first invoke commonsense understandings of the way subversive talk gets 'done' and then these understandings assert themselves so that they colour the

way phone-mediated actions are demonstrated and made observable.

DESIGN: CONTRADICTIONS AND BREAKDOWNS

To consider how this representation of phone use might be used to inform design, attention must be turned to the contradictions and breakdowns that occur in ordinary activity. This section describes two of several contradictions that were identified in the analysis and suggests some resulting design possibilities.

Keeping talk private

One practical problem that arises in sharing messages covertly is that there is always the possibility of being 'found out'. The fieldwork data indicates there are at least three ways in which teenagers have managed this problem. One method is simply to delete incriminating messages. Another is to use the message composition screen as a temporary display, where messages can be written, passed between conversants and then cleared. A third is to make the exchange ambiguous by using the phone's physical characteristics (such as its size) so that they appear to necessitate intimate proximity between conversants.

Notably, these solutions were not intended in the design of mobile phones: messages are 'designed' to be deleted because of memory restrictions; the composition screen is meant, purely, as a means to compose messages to be delivered over the network; and the phone is designed to be small in size so that it is portable and at-hand. Teenagers, however, seem to have learnt and adopted practical means to manage private and in some cases subversive messaging through these features. In short, they have overcome breakdowns that arise in using the technological tool to mediate private talk.

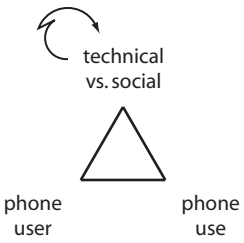

Figure 3. Conflict within mediating artefact.

Seen in terms of the AT framework, the problem of keeping messages hidden or private amounts to a contradiction (Fig 3). The contradiction exists within the mediating artefact, between its technological and social functions. On the one hand, the technological features of the phone are designed to achieve mechanical operations, subject to material and physical constraints—the phone has a limited memory capacity, it is meant as a device to transfer information over a wireless network and is designed to be portable and at-hand. However, when the phone gets used in practice, the influence of the social collective comes to have an impact on its use. The specific goals for using the phone become evident—the phone is no longer seen as a technology for distributed communication, but comes to serve as a device to covertly engage in local, subordinate talk. These local acts of phone-mediated subversion are subject to social rules ordering how such exchanges are practically accomplished—subversive talk must be divisive and must also be seen to be so. This evokes particular roles or divisions of labour—those present at an occasion fall into the roles of those participating in the subversive act and either bystanders or those subject to the subversion.

Seeing teenagers' phone use within such a system of activity offers some insight into design possibilities. One possibility for exchanging messages locally is to design a system so that messages can be transferred through bringing phones into close proximity or by physically touching the phones together. This solution might be extended so that messages that are exchanged can remain hidden, thus resolving the problem of having content, or locked messages, visible to all. Such a solution might be designed to operate so that messages are only revealed when particular phones are in contact with one another. Messages could be made 'visible' to particular people's phones so that when they are brought near these phones the messages are shared. This would cement teenagers' social groupings and permit messages to be exchanged locally whilst concealing messages' contents from bystanders.

To make this form of sharing ambiguous, a further feature that might be added to mobile phone's is the capacity to display content across multiple screens. Thus, two phones brought into contact could be configured to display one phone's content on the two screens. This feature could be designed to work across two or more phones and to display 'hidden' messages across multiple screens. Offering this feature would provide teenagers with a legitimate reason to bring their phones together. As with the sharing of a single phone, it would also make the reason for the exchange ambiguous.

Public displays of private talk

A further, more subtle, problem arises in phone use because of a conflict between the apparent need teenagers have to demonstrate their resistance against 'outside' groups and the need for subversive content and practices to remain concealed. In practical terms, this means that teenagers who work to subvert occasions using the mobile phone face two opposing goals. On the one hand, they aim to make their actions observable so that they can be shown to be subversive—resistance is only valued if it is observably demonstrated and seen to accomplish subversion in sanctioned ways. On the other hand, teenagers aim, in part, to conceal their subordinate, phone-mediated exchanges. They aim to conceal them from particular members present in an occasion such as teachers in the classroom or adversaries in the school canteen. In terms of the AT framework, this conflict constitutes a contradiction between the methods used to mediate phone talk and the socailly sanctioned rules of localised subversion (Fig. 4).

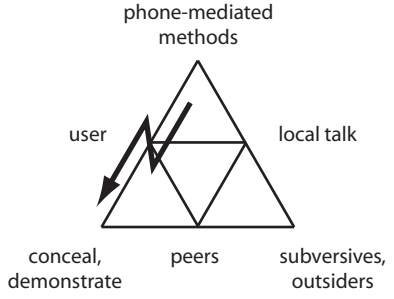

Figure 4. Conflict between mediating artefact and rules.

Phone users appear to manage this problem, in part, by relying on the ambiguity of mobile phone use. Thus, the subversive act is made apparent to the other(s) engaged in the subordinate talk but left open to interpretation for those present but not engaged. The problem is also countered through established rules of conduct when performing particular acts of subversion.

Particular methods for accomplishing subversion have become observably recognisable. For example, ways of holding the phone and posturing in places such as the classroom are recognised as subversive acts by those in the 'know'; there are, in essence, socially sanctioned methods for demonstrating subversion via the phone.

A problem that these methods reveal is that local forms of subversion can only be made clear to those who are observing the act or who are immediately next to the person displaying the phone content. If a phone user wishes to include others who are present but not in view of the phone's display, there must be some certainty that they are attending to the act, understand the sanctioned rules and can decipher its ambiguity.

With respect to design, these problems indicate an opportunity for considering new features for the mobile phone that allow subordinate and covert talk to be directed to others who are co-present, but not physically contiguous or directly attending to the interchange. A design feature that might serve to contribute to this practice is one that provides for inclusion in or exclusion from concealed subordinate talk.

During the observational fieldwork, it was noticed that some teenagers placed their phones on their sides with the screen pointing towards them. According to the participants who were interviewed, this was done so that incoming messages would be noticed on screen when the ringer was switched off or when the ambient noise prevented ringing from being heard. Such placement of the phone might also be used to demark the boundaries in which a subordinate message exchange might occur. Thus a user with a phone that is placed outside of the 'marked' area might be prevented from sending a message to the positioned phone. Access would have to be negotiated either by movement of the phone, or movement by the sender into the demarked boundaries. Noticeably, the exclusion and potential for subversion is achieved in the most casual of ways—through the placement of the phone—but effectively serves as a marker of exclusion. In some respects, the importance is not in the prevention of the exchange of messages, but in the symbol this serves. It can, in a particular situation, be seen as a symbol of defiance or resistance against those outside the boundary but only in a way that is ambiguous. It is reminiscent of the simple crossing of arms—it serves to cordon off one's social proximity to an occasion, but is open to negotiation.

CONCLUSIONS

It is hoped that this short paper provides an early demonstration of how the interpretive accounts produced from field studies can be integrated into the AT framework and subsequently be used to inform design. Effort has been made to reveal how the social order that is revealed in distinct field study traditions can be mapped onto AT's structural apparatus. Specifically, it has been shown how the socially constituted rules and orderings in teenagers' phone-mediated, conversational talk can be represented using the AT framework.

Time has also been given to explicate how design implications can be made through the further analysis of these representations. The identification of contradictions and breakdowns has been shown to be one way in which to raise design suggestions. In future work the aim is to implement some of the suggestions that have resulted from this work and assess their compatibility with the sorts of phone-mediated activities that teenagers participate in.

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Establishing user requirements – a case-study in medical informatics

Hans H. K. Andersen and Verner Andersen
Systems Analysis Department
Risø National Laboratory
P.O. Box 49
DK-4000 Roskilde, Denmark
hans.andersen@risoe.dk; verner.andersen@risoe.dk

ABSTRACT
This paper reports from a user requirement, design and evaluation study on supporting educational activities in the autoimmune serology domain. Establishing the user requirements has been based on the Cognitive Systems Engineering approach. The user requirements laid the foundation for designing the software system e-DOORS[1]. This system can briefly be described as a tool that will assist the user in recording the classifications of (sets of) medical images. An evaluation of the system showed that the software satisfactorily assisted in quantifying improvements in the education and training process and the quality assurance process, by revealing quantitative changes in recognition skills and accuracy.

Keywords
User requirements elicitation, medical informatics, user evaluation.

INTRODUCTION
Design methods or practices can be described as prescriptions for the application of a variety of design principles and guidelines in doing design (Andersen et al., 1990). Every method can be characterized as having its own domain of application for example determined by the scale of the design process. Furthermore any method forces the designer to take on the perspective more or less explicit mentioned in the method's design principles. The perspective provided by a given method will necessarily influence the way the designer perceives and approaches the domain of work in which the design has to be carried out. The perspective of the method is most visible in its guidelines for doing design. The guidelines contain techniques, tools, and principles of organization. In short, a technique focuses on how a certain type of activity can be carried out, while the tool guidelines focus on the application of a number of tools designed to be used in and to support the variety of activities. Characteristically the principles of organization provide a guideline for the determination of the division of labor and the allocation of resources.

According to Bødker (1991) a distinct characteristic of a given method is that it has been created by a designer believing to have invented a good practice for design within a given domain. The problem is that important experiences get lost and only certain aspects of the process are incorporated in the method. The consequence in applying a specific method then is that the method should not be used as a recipe to be followed step by step but rather it should be perceived as a set of guidelines from which it should be possible to derive certain heuristics for doing design depending on the application domain as we have done in this case study. Design of computer systems requires a deep and coherent understanding of the work domain to be supported. This understanding has been established by using the cognitive work analysis as a point of departure for extracting pertinent features of the work setting and for analyzing the general functions applied in classifying medial images within auto-immune serology.

Our role in the project was to elicit requirements from the users and communicate these to the designers. In this way we came to act as a sort of mediators trying to formulate expert medical knowledge into the language of the software developers. In fact not a trivial task as it turned out. The users consisted of six university hospitals and national medical laboratory scattered across Europe. The designers were located in a small Danish software company.

Methodology
The approach applied in the user requirement study has mainly followed the principles and concepts offered by the Cognitive Systems Engineering (CSE) framework developed at Risø National Laboratory (Rasmussen et al, 1994). It allows the work analyst to analyze a system of work in terms of means-ends relationships indicating the why, what and how relations among the layers in the hierarchy.

The Work Analysis takes as point of departure a systems approach. It allows the work analyst to analyze a system of work in functional terms. The methodology was not so

[1] extended Discrete Object Observation and Recognition System

much to focus on what the participants do when classifying morphological features and immunological patterns, but rather to approach the diagnosis or pre-diagnosis, respectively, at a semiological level.

The methodics applied in the user requirement study all belong to the qualitative area of research:

- Interviews (qualitative, semi-structured, unstructured (Kvale, 1983))
- Document inspection (worksheet reports, standards, quality assessment schemes, handbooks, laboratory manuals, classification lists, diagrams, drawings, etc.).
- Observations (activities at the microscope, use of existing DOORS, presentation of labs)

The elicitation of the user requirements was carried out during a period of 6 weeks visiting the seven sites. 15 persons have been interviewed (lengths of interviews 6-9 hours). All interviews have been tape-recorded. Notes were taken during the interviews. All tapes from the interviews have been transcribed. The interviews were pre-planned in terms of time and place and the nature of the question to be asked. Although we had lists of questions these were seldom followed in any strict kind of way. In some cases it helped us to keep an over-view of the course of the interview, for example, to avoid too many guiding questions, and to incorporate a number of 'checkpoints' in terms of summaries. On the other hand the form of the interviews ranges from being semi-structured to rather unstructured - almost like a conversation.

The point of departure for the interpretation and analysis of the interview material was to get an overview and establish a general understanding in reading the transcriptions. We singled out the interchanges that are more 'chatter' like. In addition judgments have been made in relation to determining the consistency (or inconsistency) of statements both within an interview as well as between different interviewees statements. The whole idea was to start out with an interpretation of certain statements and try to extract their meanings and switch back to the global meaning of the material. This way of analysis has been inspired in part by (Kvale, 1983; 1987) and in part by (Ackroyd and Hughes, 1992).

Analysis of the work domain

The CSE means-ends abstraction hierarchy has been utilized as an analytic tool in formulating the user requirements The means-ends abstraction hierarchy provides a framework for identifying and integrating the set of goal relevant constraints that are operating in a given work domain. Each of the five levels[2] in the hierarchy represents a different class of constraints. One way to think of the abstraction hierarchy is as a set of models of the system, each defining a level of hierarchy. Higher levels represent relational information about system purpose, while the lower levels represent more elementary data about physical implementation (Vicente 1999).

When we first presented this way of categorizing our data at joint meeting with user representatives and software developers there was a concern among the participant on how exactly to interpret and understand the outcome of a means-ends analysis. There was also a strong opposition among the users against the developers' way of interpreting the requirements.

We then looked for other ways to organize the requirements that could satisfy both users and designers while maintaining the idea of a means-ends analysis. We sought for solutions, and inspired by principles and concepts offered by the Work Analysis approach in (Schmidt and Carstensen 1990; Schmidt and Carstensen, 1993), from principles from within a Quality Management approach in (Brender, 1997, and Parker 1985) and the idea of relating systems thinking to systems practice in (Checkland, 1981) we chose to structure the means-ends analysis in three levels: Strategic, procedural and operational which in general turned out to be a widely acceptable and also usable solution among the interested parties.

The strategic requirements mirror the goals, purposes and constraints governing the interaction between the medical work system under consideration and its environment. Examples are: treatment planning of patients, consequences of mistakes, and improve the quality of auto-immune diagnosis. In addition, the strategic requirements represent concepts that are necessary to set priorities, such as quality of service and categories of diseases with respect to the diagnosis. The procedural requirements characterize the general functions and activities of classifying auto-immune sera based on pattern recognition of entire images. The operational requirements represent the physical activities, such as use of tools and equipment. Furthermore, the operational requirements signifies the physical processes of equipment and the appearance and configuration of material objects, such as staining, clinical information, multi-head microscopes in the traditional set-up now replaced by presentation of the images and related information supported by various software tools on the PC screen, etc.

Table 1 Selected examples from the strategic level of the means-ends analysis.

The main goal for the autoimmune serology is to: Ensure that the quality of auto-immune serologic answers gives the doctor optimal tools for setting correct diagnosis and advice patients about treatment and follow-up, and support the development of pattern recognition and exchange of images.

[2] Purpose, Goal; Abstract Function; General Function; Physical Process; Physical Form

In medical imaging, visual object recognition relies on subjective human visual perception. This process suffers from a significant inter and intra observer variability. Therefore, the variability problem is crucial when the final decision about diagnostic answer is essentially based on visual object recognition. Significant inter and intra observer variability presently exists due to: Level of experience/inexperience, deficiency of specific/objective criteria/classifications, differences in education and culture for applying criteria, differences in the hierarchy of the classification systems, technical performance in the pre-analytical and analytical phases.

Furthermore problems arise due to: Medical knowledge expands at a rapid rate. This is not always reflected in the standard classification systems, in difficult cases even experts may require co-operation in order to get a second opinion, non expert pathologist/laboratory technician frequently faces complex decision making problems that require an expert knowledge, based on personal, long-term professional experience, and problems in making efficient corporation related to consensus are mainly due to managing distribution of slides, speed of the process, and the multiplicity and complexity of classification criteria.

Requirements at the strategic level contain definitions and analyses of goals and constraints in the work system (see table 1 for an examples). Most of the procedural requirements were structured as scenario descriptions. The purpose of setting up a scenario for design is in some sense to make a forecast of or predict the use of the e-DOORS before it is actually build. In this way the scenario describes in an ordinary language format the actors' actions upon the system and the system's responds to these actions. See also Carroll and Rosson (1990) and Karat and Bennet (1991) for the use of scenarios in design. Most of the operational requirements consisted of a single text string describing physical matters and processes involved in handling the classification of auto-immune images.

Based on the analysis we created a user requirement feedback form structured according to the three levels that we distributed to the users. Based on the feedback we corrected our requirements and produced a final user requirements report maintaining the means-ends structure on the basis of which the designers prioritized the requirements according to possibility of implementation given constraints in resources and programming effort. The prioritizing was discussed at user meeting and finally accepted by the users. In this way feedback from the users not only at the end of the project, but also during evolution of the prototype secured an interactive and iterative process of development. A screenshot of the final version of the software is illustrated in Figure 1.

Testing the system

A validation of the final system was coordinated by one of the auto-immune serology sites involved (for more details on the test see Wiik and Lam, 2000). 12 people participated in the study (3 experts. 6 skilled persons and 3 novices). To be able to demonstrate any learning effects it was required that a participant classified both a baseline set of images and a certification set three times using the system.

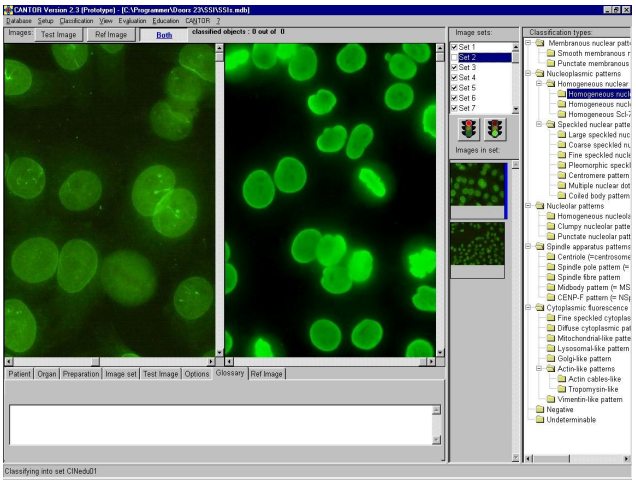

Figure 1: Screen shot of the "Matcher" tool of CANTOR. The classification types (taxonomy) are indicated in the scrollable text at the right hand side.

Table 2 Results from the evaluation of e-DOORS.

Subjects	Number of training sets	Base-line	Certification
A (Trained)	5	1.00	1.00
B (Expert)	6	1.00	1.00
C (Expert)	6	1.00	1.00
D (Trained)	5	0.97	0.97
E (Expert)	6	0.95	0.95
F (Trained)	9	0.92	0.95
G (Trained)	5	0.90	0.97
H (Novice)	9	0.90	0.92
I (Trained)	6	0.90	1.00
J (Novice)	9	0.87	0.87
K (Trained)	5	0.84	0.90
L (Novice)	8	0.74	0.95

The threshold for expertship was set at a kappa value of >0.95. One novice became an expert within 5 weeks because the kappa value went from 0.74 to 0.95. The two other novices did not improve their recognition skills significantly. As regards the trained staff, six persons went through all rounds whereas three did not. Two persons among those who completed all rounds turned out to be

experts from the start, three persons reached an expert level and one person improved considerably (from k 0.84 to 0.90) during the exercise. These data are an illustration that the e-DOORS software adequately supported improvements in the education and training process among the participants. It was estimated that the present version could be perfected to become a novel tool for education, training, quality assurance, consensus formation and standardization in several areas of microscopic pattern recognition relating to autoimmune serologic reactions with cells and tissues.

In a small experiment concerning the usability and user friendliness of the CANTOR system for education and training we found that, except for minor suggestions related to the user interface, the general opinion of the participating physicians was very positive. They found the system not only valuable, but also inspiring due to the tools allowing direct feedback of their performance as compared to the expert opinion, and allowing objective indication of personal improvement by the Kappa value.

Whether these test results can be taken as an indication of the applicability of the means-ends analysis as a user requirement elicitation method in the form we chose is still an open question that needs further investigations. Looking back at the process there is no doubt that we as mediators between the users and the developers in some way contributed to the positive development in introducing the means-ends analysis as a common ground for all. The means-ends analysis also gave us a thorough understanding of the domain that we could draw upon in supporting the developers during the design process in an iterative manner and thereby leaving the experts to do their job.

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Workshop Statement:

Anne Cohen Kiel
Design Anthropologist/Program Manager
Microsoft Corporation
Redmond, Washington, USA

Bridging the Gap: Field Research and Product Design

Ethnography at Microsoft

Understanding our users from their own perspective
One of the main goals of our work as ethnographers in a software company is to understand our users (*emic*) from their own perspective instead of from Microsoft's perspective (*etic*). As a developer, it is very easy to want to develop features that are interesting to oneself as a developer. This is fine if we only create products and features for developers, however we create products and features for a very different breed of people ☺.

The anthropologist's goal is, in contrast, to experience the world of technology in our user's own environment where activities have meaning and a direct impact on their daily life. We translate what we see back to product teams and impact how features are created so that they will be meaningful (and actually used) in the "real world" with our "real users". We can also impact marketing and strategy as well. In essence, we bring the voice of our users back to Microsoft.

For ethnographers at Microsoft, the goals are:
- To observe our users from their point of view, NOT Microsoft's point of view.
- To find out what users really want and need in Microsoft products (NOT what Microsoft thinks they want and need).
- Influence design and development (create user centric design)

When the user's point of view and Microsoft's point of view merge…we are more likely to create and design products that the user will be satisfied with and be loyal to.

We can impact product development in many ways including:
- Exploratory research of phenomena (emic, observation-based maps of the world)
- Adding depth and focus to quantitative data
- Scenario and feature development, prioritization and refinement

Ethnography at different times in the product development cycle

Early in the Development Cycle: Product Planning and Future Planning

At an early stage in the development cycle, exploratory research is an excellent way to capture the "here and now" of how technology influences our users' lives and what our users want and need. At this time, we an take the native point of view to create "observation-based maps" of some realm of the world that is specifically interesting to our company.

Exploratory Research can be used for:

- Planning for next product/release and future products/releases
- Design/Development and prioritization of scenarios and features
- Product evaluation

Questions that might be explored during this time frame are:

- How do people interact with technology?
- What are people doing?
- What might we build?
- What is going on with phenomenon X?
- What is going on with generation X?

Middle of development Cycle: Feature specific and product specific questions

Much of the work in this middle cycle can be done by virtually any usability engineer, product planner, PM or developer, designer working on specific features with minimal training (see section: Difference between site visits and ethnography). Of course the optimal situation would be to go out with an ethnographer. Usability engineers and development teams often have more knowledge of how the features work and can therefore see successes and failures with a different perspective than the ethnographer who generally has a broader understanding of the feature/product (especially when talking about an operating system).

These visits are often shorter and focused on specific feature areas and need not be longitudinal in nature (although measurement of feature usage over time is valuable information and should not be discounted).

In the middle of a development cycle, it is useful to use ethnographic methods (unguided observation) combined with site visit methods (guided questions) to look at:

- Implicit was well as explicit needs with relation to products and features
- Depth and understanding of quantitative data
- Validation of quantitative data

- systematic understanding of feature areas
- Scenario checks (refinement)

Final Phases of Product Development Cycle

During this part of the development cycle, field researchers can introduce features or have a focus on features. This can easily be done by many different individuals within the product development team, not just ethnographers. Usability engineers and development teams often have more knowledge of how the features work and can therefore see successes and failures with a different perspective than the ethnographer who generally has a broader understanding of the feature/product (especially when talking about an operating system).

Beta Testing is a unique opportunity to test the product in as close to a realistic setting as possible. While it takes a lot of planning, having a team run and observe a beta in the field allows for more understanding of how a product will affect the lives of its users. Real People, Real Data was the first program of its kind to study the operating system in its beta phases (Windows XP) in naturalistic settings.

This is useful for the following in naturalistic settings:

- Feature Specific testing
- Overall product testing
- Are the features used?
- Are the features meaningful?
- Are the features discoverable?

These visits are longitudinal in nature as it is important to see how individuals change their behavior over time when using the same (or an improved version of the) product/feature. Visits tend to be focused on specific feature areas with experimental designs built in to the visit. It is very important that the development teams have a chance to experience “the real world” as the product is being tested in “the real world”.

Analyzing and utilizing data is a team effort

The key to the success of field research is not only interest from the teams, but a vested one—When field research becomes a collaboration process within the product team and any major players outside of the direct product team, it allows for the success of building great products.

I have found it personally helpful to include the team in both the field research as well as the data analysis at each phase level. Team ownership in the analysis allows for a very easy ride from findings to recommendations. This is done through many different methods (from sticky notes with comments that need to

be sorted, to presentation of main observations/findings and having a discussion about what they mean) left to the discretion of the field researcher. Including the entire team during this process allows for many different perspectives to influence the recommendations made from the analyses that go in to the design and development of a product

Difference between site visits and ethnography

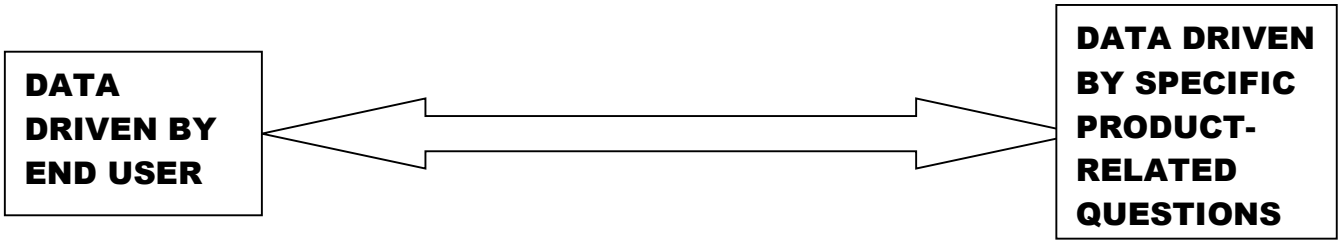
Recently, there was a round of email at Microsoft on the subject of anthropologists. The idea was put forth: Can't anyone do good site visits? The answer is yes, BUT. One of our ethnographers responded with the following quip:

> A Microsoft researcher visits a man in his home. She wants to know how he uses his frying pan. The researcher asks the man a bunch of questions: "When did you buy this frying pan? Why did you buy a non-stick pan? Do you always spray your pan with Pam? She asks for the man to tell her even more about the frying pan. First one hour, then two hours pass – the researcher is asking many many questions about the frying pan. She totally missed the *really* interesting thing the man does with his blender.

The real question, however is when to use the skills of an ethnographer and when to use the skills of other members of a product team for site visits? The answer lies in an understanding of the differences between ethnography and site visits.

Ethnographic field research and site visits have many overlapping areas --- and in fact at times are indistinguishable. Both are observational in their nature. Both strive to understand the user in a naturalistic setting, e.g. in the context with how the user actually uses technology. I would argue, however, that there is an important distinction between the two. This distinction is determined by whether the data collected is driven more by the end user (research methods primarily using participatory observation, longitudinal in nature and guided by the end user and not by the researcher) or by guided questions about specific products/features (site visit methods focusing on semi-structured or structured interviews with an observational component).

Ethnographic field research and site visits meet in the middle of opposite ends of a spectrum. As ethnographic questions become more product driven (and guided by the needs of the company) and as site visits are more about the end user's experience (and less about specific questions that need to be answered by the product/feature development team), the two become the same.



Keeping Focus on Work

Hans Erik Sørensen
Systematic Software Engineering A/S
Frichsparken, Søren Frichs Vej 38K
8230 Åbyhøj, Denmark
has@systematic.dk

Introduction

As argued in the theme of this workshop, there is a gap between field studies and design, or even multiple gaps with their own characteristics. Depending on the point of view of our inspection of this gap, we might look at different gaps with different solutions. From my point of view as a practitioner, the main question is how to get the knowledge from field studies transferred into the product or even into the code[1].

In Danish software development companies with strong managerial focus on making usable products, the two main strategies are: to recruit/employ domain practitioners to the organisation and to set up a usability group to conduct field studies and usability tests. The result of this has often been point interactions in the analysis and test phase between the development team and the people holding the domain knowledge; resulting in reduced impact in the design. A possible bridging of this gap could be as trivial as collaboration in both analysis and design, but besides the lack of integration between work-oriented techniques and system development methods, complex software development has many other factors that impede collaboration.

In the following I address this gap by presenting a case that we are currently involved in, to show the complexity in building a bridge. Although we have made the gap smaller in this project by using simple and well-known Participatory Design techniques, the gap is still there. In the last part of this paper I reflect on how Object Oriented Analysis and Design processes and techniques might help us complete this bridge by keeping the focus on work throughout the project.

Case: Electronic Patient Record

Context

In 1998 the County of Aarhus (Århus Amt) decided to develop their own Electronic Patient Record (EPR) to be implemented in all hospitals in the county by the end of 2003. It was an invariable requirement that the EPR must be capable of adapting to changing environment through configurability. The data model is not fixed but a meta model that models the information required. A change in the configuration is reflected visually in the GUI.

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[1] One of the reasons for shifting to Object orientation was to model the real world in the code, in order to get more readable and stable code.

In order not to depend on a single supplier and to increase the number of companies[2] invited to tender, the EPR was broken down into five modules: a care record entry module, a medication module, a request/reply module, a booking module and an image module[3]. Furthermore, it was decided that after an initial analysis, each of these modules should define a number of low-scale components or building blocks, which the module should consist of. Descriptions of these components was then sent to the project's steering committee that looked for similarities in the components, defined a set of common components, and then distributed the development of these components.

To ensure usability of the modules, each module was assigned a team of clinical staff (doctors, nurses, hospital secretaries etc.) to be part of the development.

The development process

Systematic Software Engineering A/S, Systematic in short, won two of these modules: the medical module and the request/reply module. Both modules used the same development process, which was heavily inspired by the Microsoft Solutions Framework (MSF) [Microsoft 1999]. The MSF is an iterative development model where each iteration goes through 4 phases: an envisioning phase, a planning phase, a developing phase, and a stabilizing phase.

The two modules went through these four cycles. The first cycle was different from the others, as it did not result in any produced code, but an initial requirement specification. The first cycle started with a one-day course on field studies for all developers; none of whom had any prior experience in conducting field studies. Because the field study method had to be easy to learn, the Contextual Inquire method [Beyer & Holtzblatt 1998] was chosen in combination with a follow-up that was inspired by the interpretation session from Contextual Design [Beyer & Holtzblatt 1998]. During the subsequent two weeks, the development team shifted between conducting field studies one day, and documenting the findings and holding interpretation sessions the following day. Simultaneously each member of the user group was asked to write a number of plus and minus scenarios [Bødker 1999] for us to know their expectations and worries. On the basis of the knowledge gained from these field studies and scenarios, we held a series of workshops with a mock-up of our initial vision of the system [Greenbaum & Kyng 1991]. After the series of field studies and workshops the initial requirement specification was written using Use Cases [Cockburn 2001] and an In/Out list together with the list of required components.

The three following cycle iterations were almost similar. In the envisioning phase we created scenarios and paper mock-ups of the functionality scheduled. The scenarios and the mock-ups were then used in a series of workshops where the mock-ups where improved. After the functionality was implemented and tested against agreed requirements, a series of usability tests were planned. But only the third cycle included usability test due to fragmentized interaction and a three month test at the hospitals after release

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[2] Currently the EPR project is calculated at approx. 130m DKK, which only very few would have the capacity to fulfil on their own.

[3] For further information about the EPR, see [Systematic 2001]..

In parallel with our development process, the user group and their organisations made use of the knowledge they had gained from the workshops and the other activities in describing current and envisioning future work practices. The information from this process was also valuable knowledge for the project.

Pros and Cons

Having the development team perform the field studies turned out to have even more advantages than expected. First of all, the data that was collected in the field studies was very detailed, considering that the observers only had a one-day training. Secondly, the developers got the data directly, thus providing a better basis of understanding than an oral or written report would have given While making the design, personal experiences were largely used in the argumentations about possible design solutions. But an unexpected result of the field studies and the other activities with the user group was the motivating factor. One of the developers expressed it like this: “The fact that I know some of the users, increases my responsibility for making a usable system”.

Although we did take domain much more into consideration when designing, than we would without the user-centred activities, it was still based on personal experience and knowledge about the context for the component being developed. Another problem we encountered was the use of domain experts in the design. Their role was reduced to making training material, defining clinical information when needed, and reviewing artefacts. The knowledge and the visions that the domain experts possessed were never used as a constructive momentum. Probably, these two problems were in our case primarily caused by two factors: the early focus on components and a highly configurable system, and the lack of integration between work-oriented techniques and traditional software design.

The division into modules, the early focus on components, and the vision for a highly configurable system were some of the main reasons for not being able to maintain a work-oriented focus through the process. Even in the early stage of writing Use Cases, we were concerned with defining components, and as a result the structure of the Use Cases was much influenced by this division of functionality into components. This again made the Use Cases difficult to read for the user group. As a consequence of others having to use components created by us, the development of components was given high priority at the beginning of the projects, resulting in a structuring of the project based on the functionality and components that had to be developed. Only in the last part of the project focus shifted back towards work in order to configure the components to the different use situations.

The second problem was the lack of integration between work-oriented techniques and traditional software design, which we probably could have minimised, but introducing even more new techniques into the project, besides the Participatory Design techniques, could have been hazardous.

Possible bridge building

Two of the main differences between work-oriented techniques and traditional system development techniques are the view on context and extension over time. Whereas work-oriented technique looks at actions as connected over time and in a context, traditional engineering technique often strives to divide problems into parameterised events that are singular in time – divide and conquer.

One of the computer science attempts to look at actions as connected over time is the Use Cases [Cockburn 2001], but having developers write Use Cases often results in use cases that are structured according to components rather than work, just like our initial Use Cases. One of the disadvantages of the formal Use Cases is the reduced content of context, but in combination with scenarios and mock-ups it is possible to preserve both context and the extensions over time.

The advantage of using Use Cases is that some of the new process models and methods like the Unified Process [Larman 2002] or Rational Unified Process build the complete development around the Use Cases. Even in the process of assigning responsibilities to different classes, techniques – like CRC cards – uses the Use Cases to play out the work. So by making Use Cases that reflect work, focus on work could be maintained a long way through the design.

Conclusion

Methods like field studies and participator techniques may be relatively easy to implement in organisations where management has strong opinions about these matters, and having developers perform such techniques with a fairly good result has also been proven, but the problem, from a practitioner's point of view, is keeping focus towards work all the way through the project. This focus on work must be considered from contract negotiation. But in the right context the combination of Participatory Design and OO processes and techniques makes it possible to bridge the practical gap by keeping focus on work practices all the way through the process, hereby allowing non-developers to be constructive in design.

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Bridging the gaps, Workshop 3 position paper. Nordichi 2002

Anders Mikkelsen
The Usability Center, KMD
Lautrupparken 40
2750 Ballerup
Denmark
Email: ami@kmd.dk

Background

I work as a usability specialist at KMD, one of Denmark's major information technology providers for the public sector. The company's primary customers are municipalities, but KMD also provides services for citizens via the internet. The usability specialists at KMD are organised in an independent unit and work as consultants for software development projects in KMD as well as for external clients. In the development projects the usability center takes care of standard usability activities such as heuristic evaluations and usability test but also workshops with end users, field studies and other user oriented activities.

The products of KMD are mostly for public local administration; and must therefore support complex law based procedures and work flows. This means that an integral part of a successful software solution is a thorough understanding of the area in order to be able to design a system that not only supports existing work but also offers new possibilities and hopefully better work practices.

How

The usability specialists at KMD are typically working on projects for a longer period of time. It is not possible to test usability into a complex system at the end of the development process, and therefore it is necessary to integrate the usability work from the beginning. In the end of the process it is only possible to do what I call surface usability; trying to make a system look a little better. But the decisions that really matters for making the system usable for accomplishing a task and supporting the work have been made in the beginning of the process. This applies especially for complex systems. We have carried out many field studies in different settings, and our experience is that there are at least two different sides of the gap that need to be bridged and that it is necessary to distinguish between the two:

1. Between the analysis of existing work practices (tradition) and a future (hopefully better, faster or cheaper) workflow supported buy the new system. (Transcendence)

2. Between the world view and background of the development team, and the world view and background of the end user

To bridge the second gap knowledge must be transferred from the end-users to development team, and also from the development team to end-user. The development team need this knowledge to be able to build a proper system **and** the users need knowledge of what possibilities the new system can offer and of how he whole process will influence their situation. In other words end users need to be helped to a situation where they can contribute not only to the analysis of the present situation but also to shaping the future. This is essential for participatory design[1] to succeed. A way to make the gap smaller is to let the development teams participate in the field studies, and there is also the pedagogical gain by allowing the two groups to meet and interact. And finally maybe the most important aspect: If the development team themselves witness a user struggle with a system they get in a position to understand the users situation and feel compassionate and themselves experience the need to implement the findings from field studies

Field studies reveals things we didn't know in advance or were aware of and highlight the differences between the world of the end user and the world of the designer/programmer. Besides the descriptions of jobs, responsibilities and tasks always differ from practice. Descriptions of jobs and procedures answer the 'what' question' not the 'how' and there is also the tacit dimensions of work that can be revealed through field studies. End users as well as system experts do not have the complete view of their work setting, but are of course biased to their own perspective.

Another argument for field studies is that the usability of these complex administrative systems depends more on the content and of appropriate procedures than of traditional (interface) usability. Consider for example a system that is easy to navigate in, follows all GUI standards, but not support the best (new) way of getting the job done. This is a much larger problem in a administrative system with numerous daily transactions than e.g. a citizens annual report to the tax authorities via the internet.

Output from field studies or other analysis-activities does not have to be in the format of text, a report for others (programmers or decision-makers) to read, a 25 pages of prose is likely to just end its life on a shelf. Instead it can be in the form of models, (usability) requirements, ideas, tools, video clips, quotations, workshop posters or prototypes are more convincing, and often more usable, than a written report. Thus it is not always a good idea to let the usability specialist go out in the field, write a report and the communicate the results to the rest of the team. The data from field studies that actually is used as input or requirements in the design is usually interpreted data, filtered by the analyst or visualised with users e.g. a prototype or even an UML-Diagram or flowchart. This means that there is a stronger emphasis on conveying and processing field information that getting data. 100 hours of work language on tape is not a good input for designers or programmers. What is needed is for instance interview *in* the work situation[2], to be able to question what one sees and hears and ask "why" questions for explanations, and not necessarily to be a fly on the wall for a month. Which is also hard to negotiate with financial managers…

Who

What is important here is that different skills are needed, and in most of the cases this means that different people are needed. An end user does not become a systems designer after participating in a workshop, and systems developers does not become anthropologists after an afternoon course in interview and observation. Sisse Finken[3] criticises what she calls the instrumentalization of ethnography, the conception that if only you have been out there and asked a user or two your and the nodded, your idea or concept has been approved. A tool that anyone can use. But ethnography (and getting from data to design) involves interpretation, processing and reflection. It is therefore a important part of the job for the person who is responsible for the analysis and/or the filed studies, to co-ordinate and make value of the skills of the participating people. The job for the usability specialist then changes from getting an assignment, go out and come back with results, to being the co-ordinator and guide of the user centered activities.

The 8 Usability Consultants from the Usability center at KMD have all different educational backgrounds including: anthropology, communication studies, literature, computer and information science, rhetoric and design studies. My own educational background is a degree in information science and philosophy from the University of Aarhus. The need for diverse or combined skills can be seen in the new borderline job titles like design anthropologist[4], information architects and interaction designers.

Examples

Sometimes field studies reveal errors or issues that go straight into systems design. We had a case where the figures from paper forms should be typed into a system. Field studies revealed that employees kept these forms till they had a pile of them, and then had the forms in one hand (some even put them on the keyboard!) and typed with the other hand. This meant that

it was a very bad idea to only use the TAB-key to tab through fields, as the employees only used the numeric keyboard. The solution that made the task much easier was to assign the same function to the + key on the numeric keyboard.

Another example involves the planning of work at a hospital. The system could display one week, but some of the departments are open 24 hours, and then it is necessary to be able to see the next week. If a nurse is working sunday night then he/she cannot work monday morning of the next week. The solution was to implement a four-week view, but when we went out to se how it worked some of the departments had 14 inch screens, and on them it was impossible to read the 4 week view. Solutions were better zooming possibilities or bigger screens… It clearly illustrates two different situations, a developer with a 21 inch screen will never come to think of it as a problem.

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[1] Greenbaum, J. & Kyng, M. (Eds.) (1991). *Design at work: Cooperative design of computer systems.* Hillsdale, NJ: Lawrence Erlbaum Associates.

[2] Beyer, Hugh, and Karen Holtzblatt, *Contextual Design: Defining Customer-Centered Systems*, San Francisco: Morgan Kaufmann, 1998

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*National Tax Board (RSV)

Systems Unit Göteborg
Anna Carlsson
+46 31 743 65 27
anna.karlsson@rsv.rsv.se

POSITION PAPER

Date
19 Aug 2002

Bridging the Gap between Field Studies and Design

The Systems Unit of the Swedish National Tax Board has a group of HCI-educated persons, working as usability designers (according to the definition by Gulliksen etc), and I am one of them.
Most of us (including myself) have a bachelor or masters degree in cognitive science, with specialization in human-machine interaction.

Since the systems unit has been (and to a degree still is) very technology-driven we have experienced difficulties, not just in trying to bridge the gap between work-oriented and systems-oriented techniques, but also in *introducing* work-oriented techniques *at all* into the system development process.
The Systems Unit has been using RUP as their system development process for the last 2 years, and during that time our group has been represented in the group of people who are configuring RUP to fit in with our way of working with system development. Since RUP doesn't really mention the word usability until it's time to test the product (or maybe when the GUI will be built), we've tried to bridge this gap by introducing something that could narrow the bridge from nothing to a GUI design.

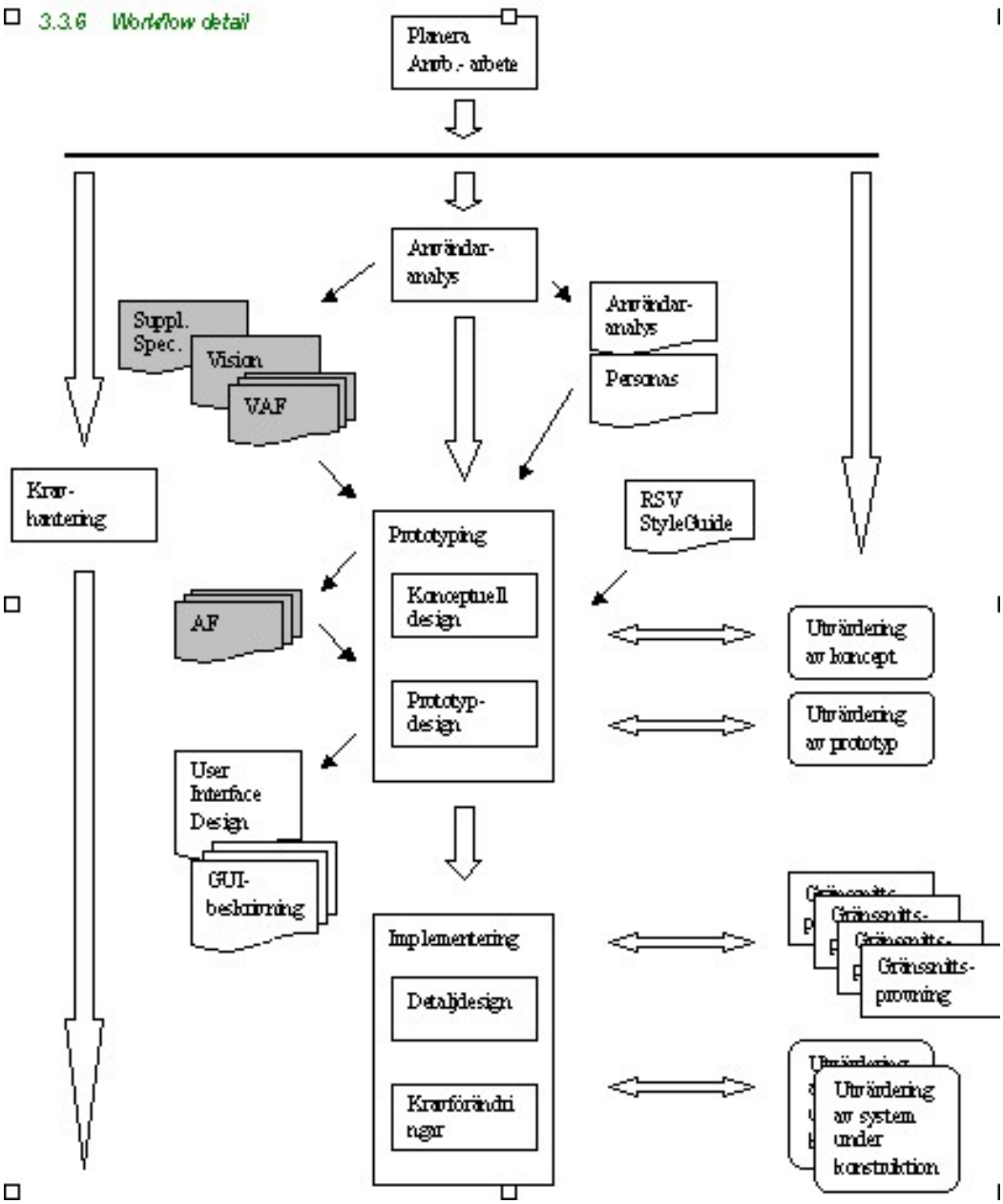
Our contribution to this work has included introducing both HCI-related methods and techniques, and the two "roles" (according to RUP's description of the word) user interface designer (which in our configuration also deals with usability issues) and usability designer (who has the overall responsibility for activities like trying to understand who the different user groups are, how they work, how the surroundings in which they do their work looks like, what their goals and needs are etc) into the development process.

This work is still not completed (and maybe it never will or should be!), and we are continuously

Systems Unit Göteborg
Anna Carlsson
+46 31 743 65 27
anna.karlsson@rsv.rsv.se

evaluating how well these methods and techniques work in the development process.

This is how we mainly work in our projects:



They rectangular boxes represent activities (where some have sub activities).
The grey documents are the one that neither of our two roles are responsible for, but where they

Systems Unit Göteborg
Anna Carlsson
+46 31 743 65 27
anna.karlsson@rsv.rsv.se

contribute. The white ones are the ones that our two roles are in charge of. The activity Användaranalys contains of activities that include field studies (on-site observations and interviews) and that lead to the two documents Användaranalys (that describes the whole situation) and Personas where we describe the personas for the project.
I think that the concept of personas makes our work a bit more understandable for the developers, who other ways have a tendency of not understanding that the future users differ from themselves in ways of how they work, how their work situation looks, what needs and goals they have etc. This also gives us the opportunity to put the future users and the situation in which they work in focus instead of just the system.

We've also introduced conceptual design into the development process. The conceptual design is a product from prototyping workshops with the stakeholders and the future users.
But still, there is a gap between the user analysis and the prototyping, where we still lack something, a way to get to the conceptual design from all the information retrieved from the field studies.

My main issues for this workshop is:

- How have others dealt with this problem?
- Since we are quite new to using some of these methods (for example Personas) it would be interesting to hear from others who might have been using it for a longer time than we have. How well do the methods and techniques fit in with their organisations, processes etc. What negative aspects have they experienced?
- Somehow, working with system-oriented techniques has a higher "status" than working with field studies. That might be one reason why no work-oriented techniques are mentioned in processes like RUP. It's also hard to find courses out of the universities that deal with usability issues on any other level than very basic. How can we get pass this?

Systems Unit Göteborg
Anna Carlsson
+46 31 743 65 27
anna.karlsson@rsv.rsv.se

- And of course I'm interested in finding out of new techniques and methods that I didn't know of!

Bridging the Gap between Field Studies and Design: A Position Paper

Steven Robert Harris
Hypermedia Research Unit
University of Glamorgan
Pontypridd, Wales, UK CF37 1DL
srharris@glam.ac.uk

Background: ICT, Adult Basic Education and the Digital Divide in the UK

In the United Kingdom, a sea change in public service provision followed the 1997 election of a New Labour administration. A renewed emphasis on the primary value of education was linked to the express aim of developing a modern information society and a commitment to tackling the growing digital divide in UK society. In 1999, government research confirmed persistent and unacceptably high levels of basic skills deficits among the adult population as one of the most significant challenges to these policies, and directed attention toward the potential uses of Information and Communication Technologies (ICT) in Adult Basic Education (ABE). The integration of ICT into ABE was identified both as an incentive to learner recruitment and as a means of developing more effective teaching and learning (Moser 1999). To date, interventions around these issues have concentrated on enabling public access to personal computers and the Internet in community education centres, schools and libraries. The provision of hardware and infrastructure has been accompanied by the development of computer-based learning and training materials. This process has largely been driven by collaborations between central government, public service providers, computing industry, and the further and higher education sectors. However, despite much rhetoric, there has been little systematic research into the impact of the introduction of these new technologies into existing educational and community development programs. There are few practical guidelines as to how ICT may best be used, and there has been minimal consideration of the role of design in this process.

The views outlined here emerge from my personal engagement with these issues, both as a researcher and a practitioner. Since 1997 I have been directly involved with the introduction of ICT to Adult Basic Education in the South Wales Valleys, a post-industrial area of the UK that is among the most socially and economically deprived in the European Union. The core of my research activity has been a longitudinal field study of ICT-related teaching and learning practices at a regional ABE Open Learning Centre. At this centre, the initially disruptive impact of the introduction of ICT necessitated the development of methods for adapting these powerful technologies to support, rather than divert, the core goals of individual and community empowerment through education. Managers, tutors, volunteers and learners at the centre have worked together to develop a successful project-based, student-centred approach that focuses on fostering the fluent and creative use of ICT to achieve goals that are meaningful for the learner. This approach, initially based on field studies of the experience of others in the US and elsewhere (e.g. Resnick *et al* 1999) and grounded in the idea of communities of practice, involved learners in the planning and execution of multimedia projects. With tutors and volunteers acting as facilitators, learners work in pairs and small groups, using high-end multimedia and digital video tools as a medium for developing their planning, research, communication and technology skills (Harris and Shelswell 2001).

Where is design activity located?

The issue of how we frame our understanding of where, when and by whom design activities are enacted is central to any consideration of the relationship between field studies and design. When social and educational technology initiatives are actually implemented "on the ground", the people involved are frequently required to employ systems and applications whose designs reflect very different (sometimes even opposing) concerns and agendas from their own. As also noted in studies of small businesses (Robertson 1998) and networks of freelancers (Törpel *et al* 2003), the challenge then is to select the most useful and usable tools from those available and adapt them to local needs and circumstances. This involves creative processes that include the appropriation of technology artifacts for new purposes; the (re)design of the physical settings in which they are used; the development of new management techniques and educational

strategies; and the (re)definition of working relationships in the form of rules and the division of labour. These complex processes resist any easy division between design, development and use; engagement with them may in itself be seen as an act of empowerment.

In the projects studied, the design process has operated at several levels. Learners have created personal and group portfolios including web sites, digital video and animation and multimedia applications. Through these activities they have contributed to the design and cooperative prototyping of teaching and learning materials, courses and accreditation structures. Learners, managers, volunteers and tutors have participated together in focus groups and discussions that have helped to shape both particular courses and the general structure of provision at the centre (Harris 2002). Managers, tutors and researchers have collaborated in the design of courses, accreditation and teaching and learning activities. Volunteers, tutors, students and researchers have worked together to select, configure and learn to use the necessary technologies. At some stage, all these design efforts have drawn on the record embodied in my field notes, interview transcripts and video recordings - the product of a field study design that has also been under continual development.

Bridging the gap: representing fieldwork data

Currently, to be involved with projects that explore the empowering uses of technology is to accept that the ability to affect the functional and interface design of the ICT hardware and applications in use is limited to what can be achieved at the local level through the processes outlined above. Evidence from the field study in South Wales suggests that sometimes ICT tools objectify accounts of reality that may be so distant from the life-experience and needs of users as to make them very difficult to adopt or adapt. For example, the use of metaphor in interface design can assume culturally-specific background knowledge, while the functionality of applications often embodies notions of hierarchy that are problematic to those who have not been formally schooled in the visualisation of such relationships. Field studies have an important role to play in informing designers of these special needs and issues, and thereby hopefully affecting future design decisions. A primary difficulty lies in finding effective means of communication with designers whose location - sometimes physically, often culturally, almost always educationally and economically - may be so remote from the concerns of these end-users as to render their requirements invisible, and in commercial terms, inconsequential.

There are no easy solutions - long-term and sustained effort is required to raise the profile of access and empowerment issues in the technology design community. One promising approach is the use of relevant field study data to inform representational strategies such as use scenarios and personas. However, such representations are fraught with difficulties, not least in that they may encourage, rather than avoid, the imposition of stereotypes and the concretization of unarticulated biases. That this is a particular danger in regard to design for the disempowered has been illustrated by many of the interactive ABE teaching materials produced recently in the UK, which, despite close attention to design, have embodied assumptions about the implications for technology use of formal literacy skills deficits that are widespread but have no basis in fact. The careful incorporation of field study data into use and user representations may be invaluable in correcting such mistakes.

In this context there may also be useful role for field study data in informing the evaluation of designs through techniques such as expert reviews and usability testing. Such techniques tend to make assumptions about users and use situations that can be usefully challenged by concrete data from observation in the field, for instance in areas such as the use of talk-aloud protocols in usability testing. More fundamentally, observation in the field of the effect of social context on successful ICT use suggests a need for new approaches to the design of laboratory studies of human-computer interaction.

Narrowing the gap: action research and participatory design

Action research and participatory design approaches clearly offer effective routes to narrowing the gap between field studies and design. Fieldwork can directly support design and encourage participation when conducted concurrently with, and at the location of, design activities - for example through the use of video interviews with project participants as a basis for discussion and planning. This kind of approach is especially valuable from the point of view of empowerment, where it is important to elicit (and value) the views of those whose personal circumstances make active participation in such "articulation work" (Schmidt & Bannon 1992) especially difficult. However, there are also many challenges. Practically, processing field

data is demanding; the effort to present information that is both timely and relevant while conducting observations, interviews and editing can be both physically and mentally exhausting. Methodologically, the necessary prior commitment to produce design-oriented output from the study also brings theoretical issues into sharp focus; the move from description to analysis must occur much sooner. In my experience, identifying a relevant theoretical framework to guide the gathering, selection and interpretation of data became a significant issue very early in the research, and became an integral part of my own design process as I struggled to refine and focus my field methods.

Closing the gap: the committed interpretation of field studies

Underlying the issues outlined above is a more general, recurring theme that it is important to address. In the context of efforts to develop the creative and empowering use of ICT with disadvantaged individuals and communities it is essential to recognise that moves from the descriptive activity of field studies to the prescriptive, decision-making activity of design are never either value free or apolitical. In order to develop practical and effective communication when designers are remote and users have little power it is not enough for researchers to simply present descriptive data from field studies from an "objective" viewpoint. Making the transition from the complex, concrete, and open-ended lived experience represented by raw field study data to the selection of particular design-relevant information is an interpretative process that requires commitment to, and advocacy of, socially aware values – and this responsibility cannot rest solely with designers.

In engaging with empowerment debates, acknowledging both the dangers and necessity of committed interpretation leads to a concern with identifying theories that will support and orient the research process - with the consequent requirement that any such theoretical framing must be specifically human-centred and explicitly deal with what critical psychologists term the "emancipatory interest" (Austin & Prilleltensky 2001). From my perspective, cultural-historical activity theory (AT) appears to offer the appropriate conceptual tools for understanding the role of designed artifacts, while maintaining a clear focus on the use of research as a basis for intervention. By combining an emphasis on the specific detail of the situation under study with an awareness of its underlying structure and dynamics AT offers a framework for developing a common language that may help field studies speak more clearly to design.

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It was during the education[1] as industrial designer I first became acquainted with the question of man-machine interaction. The relation between user and product attracted my attention and seemed to contain essential aspects to the work of design.

It was during the student days that I executed my first professional piece of interaction design[2] in 1998. Naturally this work was based purely on the methodology of industrial design. It is important to stress that this point of view can be seen to differ from much man-machine interaction work. For me it seems important to keep, what I like to refer to as, a humanistic design approach to any kind of product development. This also fits the viewpoint that any product design is a question of interaction and communication (regardless if you are doing simple shaping or ex. a complex graphic userinterface).

So what is a fruitfull methodology composed of? Every "traditional" design and interaction design project I have been involved in until now, have been crucially unlike. It is therefor doubtful that a specific set of methods will be sufficient[3]. As an industrial designer one of the most important questions is to feel or sense the situation in which the product appears, how the product will relate to the context etc. To do this, we have to make an analysis which include gathering and handling of information. The use of methodology in the initial analytic phase as well as in the creative phase is crucial, but the set of methods should be carefully chosen from a humanistic point of view, so that the methodology fits the specific an unique task in question.

The work of solving design and interaction design solutions, has brought me to take up education[4] at Center for Semiotics, University of Aarhus.

Every product as well as every independent part of a product can be seen as holding and communicate expressive values – information - meaning. The difficult part is to handle all this information in a homogenious way that take miscalculation and contextual noise into account. Awareness of signs, sign relations and perception of meaning can, I believe, prove to be useful to the interaction designer, when constructing a communicative architecture.

To end this paper I doubt that we will ever be able to forecast every future aspects, but this does not mean that I dissociate from any critical use of methods and knowledge for better understanding of the user and the interaction process. On the other hand - if we were able to grab a "true picture" I think our work would be boring...

Sune Schmidt
sune_schmidt@hotmail.com

1 - Institute of Design, University of Umeå, Sweden
2 - for Ericsson Telecom AB, Home Automation
3 – the changing tasks of the industrial designer is both a privilege and a methodic inconvenience
4 – parallel to running cosultancy business

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List of participants

Name	Email	Organisation
Hans Andersen (with Verner Andersen)	hans.andersen@risoe.dk	Systems Analysis Department Risø National Laboratory Roskilde, Denmark
Claus Bossen	bossen@daimi.au.dk	Center for New Ways of Working University of Aarhus Aarhus, Denmark
Anna Carlsson	anna.karlsson@rsv.rsv.se	National Tax Board Systems Unit Göteborg Sweden
Steven Robert Harris	srharris@glam.ac.uk	Hypermedia Research Unit University of Glamorgan Pontypridd, UK
Steve Howard	showard@unimelb.edu.au	Dept Information Systems University of Melbourne Australia
Martin Johansson	martin.johansson@interactiveinstitute.se	Space and Virtuality Studio Interactive Institute Malmö, Sweden
David Jönsson	davjo@ida.liu.se	Linköpings Universitet St. Larsgatan 25B Linköping, Sweden
Anne Cohen Kiel	annekiel@microsoft.com	Microsoft Corporation Redmond, WA USA
Anders Mikkelsen	AMI@kmd.dk	Usability Center KMD Ballerup, Denmark
Sune Schmidt	sune_schmidt@hotmail.com	Industriel Design Mindegade 3 Aarhus C, Denmark
Werner Sperschneider	werners@daimi.au.dk	Center for New Ways of Working University of Aarhus Aarhus, Denmark
Dag Svanæs	Dag.Svanes@idi.ntnu.no	Dept. Computer and Info. Science NTNU Trondheim, Norway
Hans Erik Sørensen	has@systematic.dk	Systematic Software Engineering a/s Åbyhøj, Denmark
Alex S. Taylor	alexander.taylor@surrey.ac.uk	Digital World Research Centre University of Surrey Surrey, UK