Situated Research and Design for Everyday Life

This paper presents examples of different aspects of design in a disability context with the aim of revealing some of its fundamentals. It particularly emphasizes situated aspects of research: the need for being there, with the users in their daily lives – where the action is.

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INTRODUCTION

The researcher's opportunity and ability to be involved through situated action [48, 7] while designing is of great importance. The same goes for his or her ability to learn and invent from the situation and to activate and integrate knowledge from previous situations/design processes /technical expertise.

The situated action and situated design perspective is both synchronous and asynchronous. By asynchronous we e.g. consider that one of the most important aspects of the situated perspective is its strong triggering of memories from earlier design situations: you get so close to a situation that associations to other similar ones are almost unavoidable.

Observations and participation are necessary but not sufficient conditions. What a person sees depends on his or her perspective, previous experiences and knowledge (obvious in hermeneutics and phenomenology but not always so in technology or medicine). Sometimes, the introduction of a new technology helps elucidate earlier inconsistencies [35-37].

DESIGN AS A NATURAL HUMAN ABILITY

"Design is such a natural human ability that almost everyone is designing most of the time – whether they are conscious of it, or not" [40]. Design is not only a professional or research activity – it is also a common, everyday, human activity, not least among people with disabilities. We can distinguish among design as an ordinary activity performed by everybody, design by professionals and design by researchers. Professional design is based on professional design competencies and is often either put into production (e.g. mobile phones) or made into individually tailored solutions (e.g. a submarine interior layout). Design by researchers is a special category: as designers we explore reality and obtain knowledge through design. Ideally, a design process leads to designs ready for use by the individual. Even when this does not occur, rough prototypes and concepts may result. These, accompanied by insight into problematic situations, lead to more general knowledge that can be applied in other design processes.

Example: Support in the design situation on the detailed level. A game for people with cognitive limitations was developed and used. What was most important was not the actual prototype, but the principles that were discovered through its usage concerning rules for turn-taking, simplified dice, the elimination of some rules and visualization of others. These principles could then be used in the development of other games.

The results in the doctoral thesis, *Customer-Oriented Product Development,* indicate that user-produced ideas might not only be relevant and useful, but also technically innovative [34].

Example: The shopinette. When Elisabeth, 84, did not have a practical vehicle with which to go shopping, she invented one: a kick scooter with room for a shopping bag on the foot platform [51]. The prize-winning shopinette fulfils all the

necessary requirements for stability, space, steering and braking (Illustration 1). It also provides food for thought – contemporary design and technical developments have devoted so little time to such an important area as elderly people and design [19].

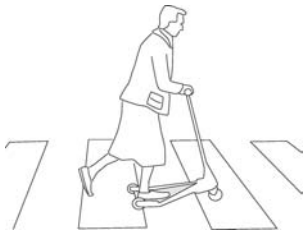

Illustration 1

Independent of the purpose of the design or who is going to implement it, user participation is necessary in most contexts, particularly for people with disabilities. A closer look at design and design processes will help to understand the core activities and problems encountered. Lundequist divides design into three classes: design of artifacts, production of artifacts and use of artifacts [29]. One could also distinguish between:

- Qualities a future artifact should have (i.e. the goal of the design)
- Means needed to produce an artifact (methods, activities and resources)
- Definition of goals and designing of methods for the use of the final artifact (i.e. planning of use, operation, service, maintenance and redesigning of the final artifact).

Design for rehabilitation engineering requires that we utilize all the means at our disposal to acquire information. We need to try and place ourselves in the user's situation, before and during the entire design process. The process cannot be considered complete just because the product is there and functioning in application. Certec, Division of Rehabilitation Engineering Research (http://www.english.certec.lth.se), often maintains that the most important step in research comes when the artifact itself, the way in which it is used and its effect on the person involved yield information back.

Example: Right handedness is not in the hand but in the brain. A robot arm can be mounted on a wheelchair's left or right side. If the person is right handed and has some function in her right hand, the joystick is usually mounted on the right. That means it is difficult to also have room for a robot arm there. Thus, it is often placed on the left. This causes problems when the person pours a glass of water from a pitcher. She pours from the right, just as she would if she had been able to use her right arm. But the robot arm blocks the view of the glass and it is difficult for her to see when she is pouring. A right-handed person should always have her robot arm and other aids mounted on the right. But problems can arise: When a right-handed personal assistant is going to help button her jacket, the robot arm is in the way [8] (Illustration 2).

The thoughts of "the reflective practitioner" [47] are important, not only during but after the individual design process. They can advantageously focus on what has been revealed in the person involved through the advent of the artifact and what has changed (in exceptional cases, it can actually be the person's entire life situation).

In other instances, it is not until we have developed a large number of artifacts for different purposes for the same person or group that we can see the common denominator. Through the insight thus gained, we can more quickly get at the best possible artifacts for the group of people involved [50].

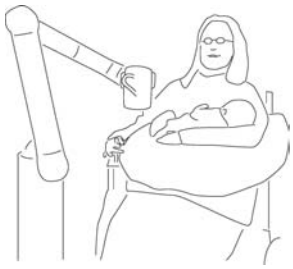

Illustration 2

Example: Diffuse cognitive contours – the underlying problem To see the common denominator in such widely varying activities as brushing teeth, cutting the grass, baking a cake, vacuuming or telling time can be difficult. If you study an entire arsenal of cognitive artifacts for people with cognitive limitations, it becomes apparent how the solutions are essentially similar and how they solve the same underlying problem: the phenomena have diffuse cognitive contours and that is why the users need distinct cognitive artifacts to assist them. The next design process that deals with a shaving aid, for example, can as a result of this insight, get straight to the point: what needs to be compensated for are the diffuse cognitive contours. This does not mean that a shaving aid can be designed without user participation. But the key person involved – the co-designer who will be using the artifact – does not have to invest a lot of unnecessary time in testing prototypes that do not address the underlying problem. It is also obvious that the designer saves considerable time and money [50].

Example: More is different. Time measurement is an example of an area of crucial significance for people with cognitive limitations. Not being able to orient oneself in time results in constant anxiety. If you examine many clocks developed for people with cognitive limitations, you can see that they all have fixed, person-independent points and scales, i.e. ones that are not dependent on or associated with other people in the surroundings. Moreover, these forms of time representation concentrate on the strengths of the person for whom the clock is intended [50].

THE TIME FACTOR

The time factor is often critical in rehabilitation engineering and design. Children with disabilities are aging at the same rate as able-bodied children. Solutions that appear two years later are no longer solutions to the current problems. The same goes for many adults with rapidly progressing illnesses or disabilities.

Time is a very important but unfortunately often neglected factor. The development of a new assistive aid often takes so long that it is impossible to link the process to the person it was intended for. In the meantime, he or she has moved on to other dreams, wishes and needs. If you are involved in an interactive design process, there are two slightly different ways you can approach this issue. In the first, the aim of the project is to create, together with the person who needs the artifact, one that he or she finds useworthy in the specific and current situation. During the process, an artifact emerges that is a more or less successful response to the co-designing person's immediate needs. This process can necessitate several prototypes, tests and mock-ups in order to approximate an artifact that meets these needs. If you do not find the right solution immediately, you feel that you are at least heading in the right direction together. What is created is intended primarily for the person who is the co-designer, but with the hope that several others with similar needs can use it or gain inspiration from it to start a design process of their own.

In the second approach, you as a researcher in co-operation with the above-mentioned user of the artifact create a picture of the existing needs and how an artifact can be designed to suit the group or category of people for whom it is intended. In this scenario, the person you are working with is a representative of a group and the objective here is to gain knowledge about the group's needs through this person.

In both cases, it is important that something for one person can be something for many with similar needs. The difference is to be found in the time aspect. In cases where the first approach is applied, those involved have to be fully aware that time is not neutral.

Interactive design also involves the creation of expectations; it inspires and offers hope for many people with disabilities. This entails, if nothing else, a moral duty on the part of the researcher to succeed in producing an artifact within a reasonable time framework. In this context it means soon enough so that the persons who have participated in the design process can use it. They may not be particularly interested in giving of their time and effort again if there is no visible result. It is important to safeguard the credibility that exits between the researcher and the co-designer. Accordingly, the result of every design process should make a difference for those involved from the start.

DESIGN FOR EXPERIENCE

Design does not only result in form and function; it also results in experiences.

Example: To have control over your own history. At an early stage in the Isaac Project [21], a man wanted to take a trip back to the institution where he had lived as a child. He wanted to take digital photos of the buildings that had been significant to him for decades. Why was that so important? One likely explanation is that he always had to rely on others (staff members) to remember important elements of his life history. As they quit, his own history crumbled away. When he had control over the pictures of the buildings, he was no longer as dependent on others to remember.

Example: Insight through user testing. A researcher started a project on navigation in urban environments. The objective was to give friends of people with cognitive limitations an easy way to provide them with navigational advice using a mobile phone with a digital map. The researcher put much effort into what he thought was the major challenge: how to explain different routes from one location to another. He carried out the project in close collaboration with a few subjects. In the process, however, he realized that he had missed two other crucial challenges that became apparent through iterative user testing: understanding exactly where the user is located (including nearby landmarks) when requesting help and exactly where he wants to go. Due to the limitations of GPS information, there is a margin of error in locating the user on the digital map. It is not possible to find out exactly which direction he is facing. Without that information it is quite difficult to know if you should tell him to turn right, left or go straight ahead. Another consideration involves his understanding of the concepts "right" and "left". All this requires knowledge of the user's abilities, strengths and weaknesses. He may know in general where he wants to go ("A shop with lots of cards where they develop photos at half price."), but not the name of the shop.

For people with cognitive limitations it is important that a phenomenon offers a feeling of:

- **S**ecurity
- Con**T**ext
- **E**xperience/Memory
- **P**recision

The four underlined letters form the acronym "STEP" and can work as a mnemonic rule in many situations, not only in the design of artifacts but also in reciprocal interactions. The STEP method has its origin in the context of cognitive limitations. Its contribution to general design science is in discerning concepts that can guide the design process, its results and their evaluation. Critical questions are: Does this strengthen the users' perceived **S**ecurity? Does it help them refer to (or shape) a sound con**T**ext? Does it build on previous **E**xperiences and shape new relevant ones? And does it have a distinguishable **P**recision [50]? (Illustration 3.)

Illustration 3

Example: Precision in expression of time. At a group home for adults with cognitive limitations, the staff frequently used the expression "a while". But the concept "a while" is so inexact. Depending on who was working, "a while" could mean anything from a few minutes to hours. Instead of placing the responsibility on those who used the term, the residents with reduced cognitive abilities were forced to look for possible patterns in how it was used. By introducing a standardized "while clock" it becomes possible for people who live in the group homes to experience precision while it at the same time reminding the personnel of the importance of being more specific in their formulation.

An idea fundamental to the STEP method is that cognitive processes and problems are distributed over people, time and artifacts. They should thus be studied, analyzed and sometimes solved in actual interactive situations [50].

ENGAGING USERS IN THE DESIGN

A cornerstone of fruitful design is the necessity of involving users in the design process. This engagement requires not only that users become active in the process but that developers also engage themselves in gaining a better understanding of use contexts and situations [26, 42].

Example: It is a matter of the experienced whole rather than the parts. For a robot researcher, it may seem natural that voice control is the best controlling system for a person with a physical disability. The researcher, though, forgets that one of the most important motivations a person may have for really wanting to use a robot can be so that she won't have to say anything, won't have to concentrate on giving oral instructions and will be able to do it herself – which means that she can think of something else during the time.

There are many ways to involve users in a design process [44]. The concept "user-centered design" emerged in the mid-1980s. According to Gould and Lewis, the three main principles of user-centered design are: early focus on users and tasks, empirical measurement and iterative design [14]. Early focus on users and tasks incorporates various methods to examine characteristics of a user group through, for example, user mapping, task analysis, questionnaires or direct observation.

These surveying methods are described in the EU accessibility project USERfit [43] or standard human-computer interaction and human factors literature [46, 15]. Empirical measurement is the practice of letting future users use simulations and prototypes, and measuring their performance through quantitative feedback including measures of efficiency, number of errors and time to complete tasks. Good descriptions of such test methods may be found in the *Handbook of Usability Testing* [45]. Iterative design is a standard component in design methods [13] and means that there should be a cycle of design, testing and measurements that is repeated as often as needed, starting with early prototypes. Usability engineering builds on the user-centered approach, but attempts to make the process easier to fit into an engineering perspective by focusing on the usability goals as a measure of when the iterative design process may be stopped.

The participatory design approach has its roots in a Scandinavian tradition. Bødker and Iversen [5] suggest an understanding of design and its relation to users and use based on the four following assumptions:

1) Designing in context. Designing a computer artifact means designing conditions for the whole use activity.
2) Communities of practice. Users and designers have different backgrounds and belong to different communities of practice [27].
3) Experiencing future design. The users need to experience the future computer application in order to place demands on it.
4) Transcending practice. The practice of the users is the starting point for design. At the same time users need to be confronted with, and to experience new ideas in order to transcend their own practice.

Early practices of the Scandinavian participatory design tradition [9, 3, 4] often assumed that any touch of the users' hands secured development of meaningful artifacts [5] (Illustration 4).

Illustration 4

Now participatory design has reached a level of maturity implying a change in discourse. Two constituting elements of participatory design practice are suggested [5]: First, the existence of a shared "where-to" and "why" artifact, and conscious work with this artifact that helps focus the direction of the participatory design. Second, professionalism based on an ongoing reflection and off-loop reflection among practitioners in the participatory design process.

DESIGNING IN CONTEXT

Contextual design is a more situated method that emphasizes interviews conducted in the context of the user's work, co-designing with the user, building an understanding of work in its context, and summarizing conclusions throughout the research [53]. A variety of methods for gaining an understanding of use situations have been introduced in the participatory design tradition. Ethnomethodological approaches have introduced the idea of videoethnography as one way of understanding use situations [49]. But what does it mean to understand a use situation when working with users? Kensing and Munk-Madsen drew up an early and useful framework for this [24].

They suggest that we consider three different areas of discourse: users' present activity, technological options and the new system during the participatory design process. Furthermore, they suggest that for all three areas of discourse we make a distinction between abstract knowledge and concrete knowledge (Illustration 5).

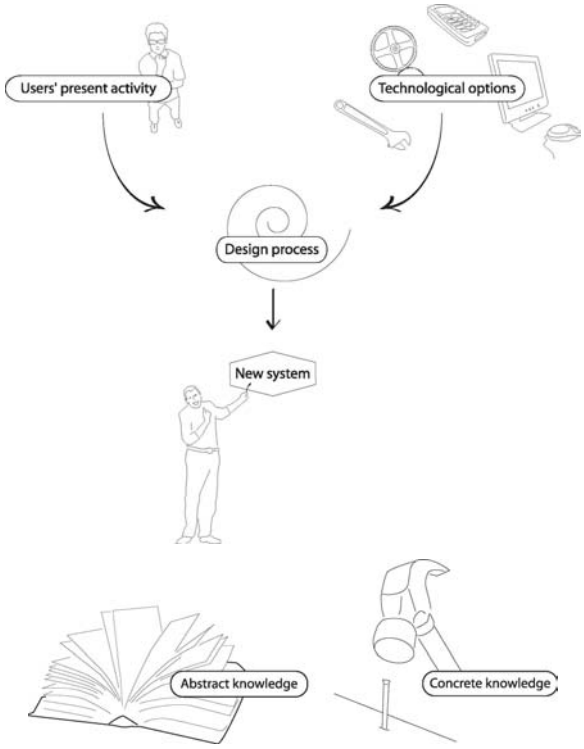

Illustration 5

Using videoethnography, for example, is a way of acquiring concrete knowledge about the users' present activity, whereas setting up an organizational hierarchy is a way of acquiring abstract knowledge about users' present activity.

We can assume that users already have concrete knowledge about their present activities, for instance bicycling, but not necessarily abstract knowledge. Knowledge remains tacit unless you are able to formalize or abstract structures from concrete situations. You know how to do something, but are not able to explain how.

Designers usually do not have concrete knowledge about the users' present activity, but are often offered formal – abstract – descriptions of it. A situated approach is the best way to avoid the pitfalls of situations involving users with only concrete knowledge and designers with only abstract knowledge. Users and designers can be considered two different communities of practice.

ABDUCTION

Situated research is closely connected to the acknowledgement of abduction as a fruitful method for scientific work. Abduction starts with empirical facts as does induction but accepts that (earlier) theories determine what facts are observed and how they are interpreted. During the research, sudden discoveries or new patterns for interpreting empirical facts may lead to new hypotheses. Theories as well as observations must then be reinterpreted [1, 41].

In abduction one strives to describe not only the changed views but also what characterizes the "new glasses" for observation and analysis compared to the old ones. Cultural probes can be an excellent means in abduction since the outcome of cultural probe studies urges reinterpretation and reflexivity.

In reality, abduction is frequently used in the natural as well as the social sciences, even if it is not always recognized. It is more common in rehabilitation engineering and design due to the large probability that a situated, intense, creative and concrete human-related process yields an unexpected result and urges a reinterpretation of the starting point and initial hypothesis. Old thought patterns may be questioned and so the spiral of abduction is initiated.

The genius and experiences of a skilled design researcher are preconditions for a rewarding outcome of abduction in rehabilitation engineering. A relevant and fruitful association at the right moment, a threaded pattern guiding thought processes, and a clever preliminary hypothesis are necessary – if not, it is a waste of time, especially for the disabled person. But however brilliant the designer might be, the need to listen to how reality "talks back" is as necessary as is the ability to gain new ideas from reflection.

WHERE THE ACTION IS

It is not just a matter of being there, of being situated, but also of grasping the action in its context; not to immediately intellectualize it [38, 39]. This is comparable to the methods of ethnology as described by Håkan Jönsson [23]. Action goes for both the designer and the participants – the central persons (Illustration 6).

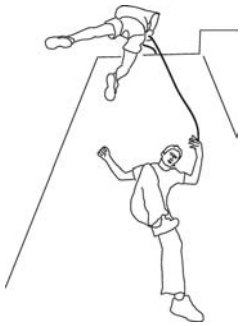

Illustration 6

The question that faces a research project is, "What do we have to do in order to find out?" rather than, "What is the situation?" By acting, you can capture at an early point many of the practical problems and conditions that you would otherwise have missed [48]. The technology itself can serve as a catalyst and can provoke reflection, answer existing questions while at the same time raising new ones [18]. Technology can be designed so that it affords new, exciting possibilities, not just so that is answers the conscious needs you are already aware of.

Example: Technology as a challenger/teaser. A physically impaired woman wanted to have a robot arm for a variety of reasons, some of them very concrete and immediate. But another even more significant one was that she knew that with its help she would be able to come up with many new areas of use and ways of using it. That was the moment of triumph – all the unthought-of possibilities [8].

Example: Learning potential. An "hour rule" time telling device is more exciting than a door opener. A door opener can be used for opening doors. Period. But an hour rule can have all kinds of imagined and unimagined uses: structuring, planning, sequencing, etc.

Both examples are closely associated with learning and empowerment. Technology that leads to something else is exciting; people learn and change, reshape the technology and are reshaped by it [50].

Edwin Hutchins started to use the concept "distributed cognition" (Illustration 7) in the 1980s to indicate that the thinking of individuals arises out of an interaction with other people, objects and systems (each considered an actor in the process). Hutchins has studied cognitive processes in the cockpits of airplanes and on the navigation bridges of navy ships. He demonstrated that the final result of the actors' cognitive co-operation could not be derived from any single actor but was the product of their interaction. But Hutchins goes even further than that when he attempts to explain cognitive processes. Thinking is so dependent on cultural and social phenomena that it cannot be studied under artificial conditions in a laboratory but only in real situations, which is apparent from the title of his well-known book, *Cognition in the Wild* [17].

Illustration 7

Example: Media as mediator. People often learn the best by meeting others with similar problems. When you can identify with someone else, you do not feel alone. If you can meet others with similar problems but who have come further – good role models – you gain hope of achieving a good quality of life yourself. The internet is a superb meeting place for these kinds of conversations. There you are able to think first and express yourself later. It becomes a more reflective discussion compared to the normal ones that occur in the same place and at the same time. Many abductive elements are included in this kind of conversation, both during and after [2].

A phenomenologically based contribution in the interaction design area is Paul Dourish's book *Where the Action Is: The Foundations of Embodied Interaction* [7]. Dourish comes from a computer science background but contributes in this work to new perspectives on the philosophy of science and methodological approaches for interaction design.

"Embodied interaction" is an approach to interacting with software systems that emphasizes skilled, engaged practice rather than – as we often see in computer-based practice – disembodied rationality. Dourish bases his analysis on movements in the human-computer interaction and interaction design areas, referred to as "tangible computing" and "social computing". Dourish formulates his ideas in contrast to the narrow cognitive perspective that has dominated the thinking of computer systems.

Interaction designers need to understand that interaction is closely connected to the context in which it occurs; they must develop sensitivity to settings and understand how interaction is embodied within them.

Example: Technology in context increases precision. A person with a physical disability thought her wheelchair-mounted robot arm was too slow. This information cannot just be pulled out of context and result in the robot being supplied with stronger and heavier motors (something that probably would

make the robot less useful). "Too slow" can refer to speed but it can also refer to acceleration. It was, in fact, "too slow" when she tried to fry meatballs: they slipped away when she attempted to turn them with a twist of the robot arm. In this case, it was the acceleration that was too slow. It was also "too slow" for stirring sugar in a teacup. In this case, the speed was too low. But neither of these needed to be remedied with stronger motors: both the twisting and the stirring problems could be solved technically with an improved construction of the grip device.

An embodiment approach reflects a more general approach to considering work activities and artifacts in concrete rather than abstract terms.

Example: Technology as an eye-opener. During a fire drill in a group home for people with developmental disabilities, a staff member held a lit cigarette under the smoke detector and asked the residents what they were supposed to do when the alarm went off. One of the residents got up and leisurely walked over, picked up a newspaper, went back and waved it under the smoke detector. It turned out that every morning when they toasted bread, the smoke detector went off. A staff member usually fetched a newspaper and waved it under the smoke detector to stop the alarm.

Example: Concrete and logical situated understanding. One Saturday morning at 7 a.m., a man rushed out of his apartment down to the bus stop. By chance, his personal assistant just happened to be walking by and saw him waiting at the bus. When the bus was about 10 meters from him, he rushed back into his apartment. Why did he do that? When she asked him a little later he told her that he was looking at the number of the bus; if there was only one digit, it was a workday, but if there were two digits he was free. Today there were two, which meant that he was off. During his 16 years in special education he had repeatedly practiced the days of the week without any real understanding. Now he had discovered a method on his own for determining if it was a workday or a weekend by looking at the number on the bus.

Artifacts of daily interaction can play different roles through their direct embodiment in the world we occupy.

Example: Visibility as a tool for empowerment. In addition to the bulletin board with pictures of the staff members who were working that day, a group home had one with pictures of those who were not. Early one morning, a young man moved the picture of Max from the working bulletin board to the one with those who were off for the day. Then he went back to bed with a satisfied expression on his face. He was unable to talk, but the pictures afforded him the opportunity to clearly show that he did not like Max. He had tried to express it in other ways before, but neither Max nor the rest of the staff had understood. For the personnel, the use of pictures was primarily a way to give information; for the resident in question, it also became a way to make a point and to wish.

CONSTRAINTS

During our work with knowledge-based systems and tools for visualization of knowledge structures, we have come to focus on the importance of constraints [32]. Constraints may sound negative, but in fact they are often a necessary condition for much of the activity we humans engage in. Well-selected content constraints constitute a support not only in problem solving but in such things as creative/artistic activities [13]. In order to deal with problems, we simply have to limit ourselves. External constraints can be an added value in this situation because we need not put energy into keeping track of them and instead can focus on what is important in the current context (Illustration 8).

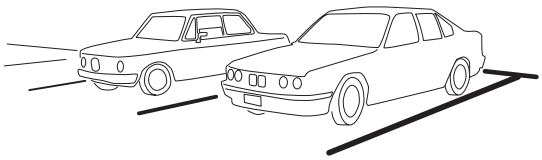

Illustration 8

And constraints may not only concern content; they are just as important when it comes to structural or dynamic factors. In this way, constraints tie in naturally with the reflection in and on action described by Schön [47].

In a situated approach, the actual context automatically provides a set of external constraints relevant for the situation in question. A non-situated approach may cause the designer or the researcher to ignore constraints in the situation; it also forces the designer or researcher to spend time and energy trying to find and uphold the appropriate constraints. The full complexity of reality will rarely be found even in a detailed description. This is particularly true for the evolution of constraints – the fact that the situation and thus the constraints will evolve during the design process.

COMMUNITIES OF PRACTICE

Lave and Wenger coined the concept of communities of practice [27]. Originally it was used in the understanding of situated learning processes in organizations, but has also become quite influential in participatory design as a way of understanding relations between different groups of users in a specific context [52]. According to Lesser and Storck, a community of practice is "a group whose members regularly engage in sharing and learning, based on their common interests. One might think of a community of practice as a group of people playing in a field defined by the domain of skills and techniques over which the members of the group interact. Being in the field provides members with a sense of identity – both in the individual sense and in a contextual sense, that is, how the individual relates to the community as a whole" [28].

It is useful to consider designers as one community of practice with a certain set of skills and techniques, and different user groups as other communities of practice with other sets of skills and techniques.

EXPERIENCING FUTURE DESIGN

Experiencing the future is essential when it comes to letting users engage in design of artifacts and their contextual use. Users need to get an early "touch and feel" of the artifact and its use context. Mock-ups, prototyping and use scenarios are well-known methods for this [25]. A more recent method is video prototypes, where users and designers together direct and film short "trick videos" simulating working designs [31]. Another way of experiencing the future is to play with early versions of the technology. By letting users experiment with different building blocks (such as a personal digital assistant, a mobile phone, a hand-scanner), difficulties, new usages, interesting combinations, anxieties, etc., are revealed [22].

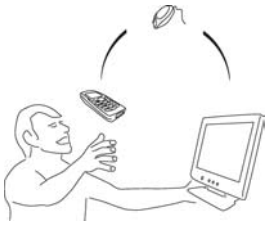

Illustration 9

In such a situation it is crucial to make sure that the users feel comfortable with the technology by ensuring them that they cannot harm the device or cause any problems by trying it out – almost like when children fearlessly press all the keys and click everywhere with the mouse (Illustration 9).

CULTURAL PROBES: ENGAGING USERS AND TRANSCENDING PRACTICE

Cultural probes can be used for: contextual design, communities of practice, experiencing future design and transcending practice [10]. To transcend well-established practices and habits based on many years of experience, it is necessary to establish and use methods and means that allow the viewing of well-known situations and environments in a new way. Metaphorical design [30] and future workshops [24] were early attempts. Cultural probes can be considered as another method based on the idea of transcending practice. Proposed by Gaver [10], the cultural probes method has it roots in an artistic, design-oriented approach. It has attracted substantial interest in the research community of interaction designers oriented towards conceptual design of interactive digital devices [6, 11, 16].

The idea of using probes is to provoke human beings to transcend their usual way of thinking, living and working by providing a probe kit to "think with" in different everyday situations (Illustration 10). Cultural probes can also be used to explore learning processes and learning spaces [12].

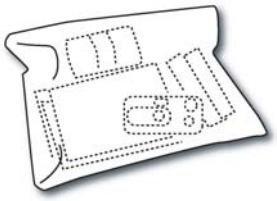

Illustration 10

Example: The Mobility and Learning Environment Project [22]. At an early stage of this community of practice study, we adopted a metaphor for the students involved as nomads, roaming around the school, camping in the lounge suites, workshops and computer labs. The probe kit (Illustration 11), placed in a customized bag, consisted of:

- Ten different color envelopes containing various assignments
- A disposable camera
- Two maps of a specific school at Malmö University
- One map of central Malmö
- A pen
- A glue stick

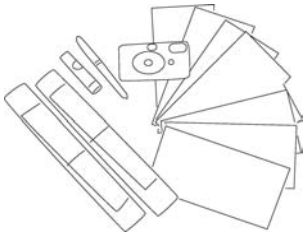

Illustration 11

The following scenario gives an idea of how the assignments worked. A typical project day starts at 10 a.m. when the students receive an SMS (text) message telling them to open the green envelope. The instructions request them to gather as many participants as possible, as soon as possible to take a group picture. The idea behind this assignment is to explore collaborative structures and possibilities in the environment. The next message is sent out at 1 p.m., asking the students to photograph their current location. The aim is to explore preferred working and learning spaces. The last message, sent at 5 p.m., tells them to use the map to show how they have moved in the city during the day. The purpose is to track the spaces that students pass during a school day; to understand the relation between learning space and learning situations; and to understand the relation between their university environment and private space.

The applications of cultural probes have developed in two main directions: inspiration and information. The pioneer version of cultural probes is part of the first direction. It was developed at the Royal College of Art, Computer Related Design by Bill Gaver and focused on how the use of cultural probes among participants could inspire the design process. The group consisted of academic/artistic members who were working on how to redesign three different community sites in Norway, Holland and Italy. The probes were to provoke inspirational responses from elderly people living at the sites [10].

The information direction of cultural probes has developed out of the design research community oriented towards use of ethnographical methods in the design process. Pioneers in this usage of cultural probes have been members of the Cooperative Systems Engineering Group in the Computing Department at Lancaster University in the UK, which has extensive experience in the use of ethnography in design (http://www.comp.lancs.ac.uk/computing/research/cseg/index.html).

When Gaver, Dunne and Pacenti talk about cultural probes as a means for provoking users to gain inspiration for design, they are talking about the designers' inspiration [10]. We believe that the "friction" contained in the probe's design can also work as a way of inspiring users to create new use situations and to look at their environment in a new way – with new glasses (Illustration 12).

	Inform	Inspire
Users	X	X
Designers	X	X

Illustration 12

In an interactive design process involving people with extensive language limitations, questionnaires and interviews are extremely blunt instruments for capturing people's dreams, needs or aversions. Different kinds of cultural probes in this context are many times preferable because they do not require specific prerequisite knowledge or language abilities. In the Mobility and Learning Environments Project [22], we have introduced a number of probes in a day activity center for people with cognitive limitations. The reactions to these cultural probes have both inspired and surprised those of us who have participated in the process.

Example: Cultural probes as a source of inspiration. One of the cultural probes we introduced is the ability to communicate with one another by means of a web camera. During one of the

first connections, the sound disappeared on the computer so we could only see each other moving our lips. The researcher then telephoned the person at the day activity center and on the screen the two could see one another holding the telephone receivers at their ears. From the facial expression of the person at the day activity center, it was obvious that this was a true "Aha!" experience. It took a while for the researcher to realize that the surprise was because this was the first time the person in question had had an opportunity to see what it was like for the person who was calling, something he lacked the abstract thinking capabilities to imagine on his own. Since then, the two take turns phoning one another when using the web camera even when the sound works, because the feedback the user receives from the telephone signal and connection provides even more clues to the mystery of telephoning.

TRANSCENDING PRACTICE – METHODOLOGICAL CONSIDERATIONS FOR ENGAGING USERS IN DESIGN

The most crucial in a design process is, perhaps, to transcend well-established practices and habits based on many years of experience. To do this it is necessary to establish and use methods and means that allow the viewing of very familiar situations and environments in a new way – to make the strange familiar and the familiar strange can contribute to a deeper understanding.

Example: Expert systems. In the Svarne Project, a decision support program was developed to help staff members analyze the causes of violent behavior in group homes for adults with cognitive limitations. The aim of the project was to investigate if and how expert system technology could be used for making visible what is often referred to as soft or tacit knowledge. To elicit the knowledge needed to build the program, successive prototypes of the program were used. It was apparent that this new form of representation (the decision support program) was a very effective tool for generating discussions and eliciting more information. Svarne made, in fact, familiar situations look strange. And by doing so it forced the participants in the project to reflect over and articulate the knowledge they possessed [33].

When narrowing the range of methods and theories that we have found relevant and useful in design, we have identified several dimensions of enquiry which have been important in most of our design projects and in methodological discussions. We address nine of these in the following discussion grouped as: inspire-observe, users-designers, abstract-concrete, descriptive-normative and, finally, the degree of situatedness (Illustration 13). These dimensions are based in part on the framework of Kensing and Munk-Madsen [25] and on our inspiration from working with cultural probes. Degree of situatedness could be considered a meta-dimension, which to some extent is dependent on the other four pairs.

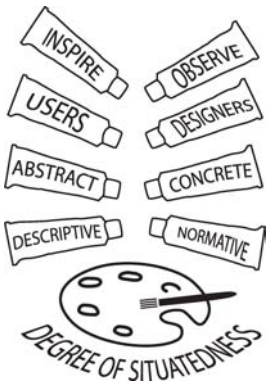

Illustration 13

The inspire-observe dimension

When designing qualities of future artifacts we need to be informed, but also to be inspired. A majority of the methods in the design area have focused on how to inform the designers. Or, rather, the role of the users in the design process has often been to inform the designers by answering their questions or being observed in relation to their current work or life situation. On the other hand, inspiration for a new design or way of living or working has often been considered the designers' domain or authority. This dimension is closely related to the discussion of whether we as researchers (and designers) should be allowed to or on purpose influence the situation we study. The information direction of cultural probes has developed from the design research community oriented towards use of ethnographical methods in the design process. In this way the researchers do not affect the users by being present and watching them, but instead collect needed information in parallel by "disturbing" the users' habits and procedures through the "friction" caused by probes; by giving the users a "verfremdung" effect (the alienation effect central to the dramatic theory of Bertolt Brecht's theatre) in their own life or work situation, which in turn can be a source of inspiration for design. The initial application of cultural probes [10] focused on "disturbance" or provoking daily living as a means for inspiration.

The users-designers dimension

The users-designers dimension is related to the question of communities of practice described in the section on communities of practice. It is important to realize, acknowledge and accept different perspectives and understandings of the use-context design. Probably the most important question here is to consider designers as one community of practice, and different user groups as others with other sets of skills and techniques. A recurring issue in different design traditions and schools has been whether the designer should be autonomous and act as an expert in understanding different communities of practice's needs and wishes when designing use qualities of future artifacts [10].

While it is crucial for designers to understand different communities of practice, they also need to create "friction" and "surprises" in the users' understanding of their own situation, as well as in the designers', as mentioned in the section on cultural probes. The essence of this dimension is the understanding of the need for creating understanding among the designers as well as users (Illustration 14).

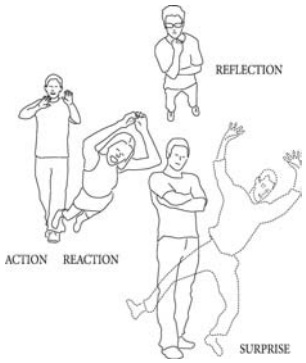

Illustration 14

The abstract-concrete dimension

Kensing and Munk-Madsen introduced the abstract-concrete dimension in design [25]. Academics are not only used to coming up with abstract representations in almost all areas, but are forced to do so as a demonstration of systematic and high-

level understanding of a specific problem. Daily life experiences and concrete observations rarely count on their own. The concrete and the abstract are complementary, and we should be much more aware of reaching for and understanding on both levels during the design process. Not only should we as designers develop both forms of knowledge, the users should also be allowed to create both an abstract and a concrete understanding of the future use qualities and technological options.

The descriptive-normative dimension

This dimension is an overall issue related to the other three. It is a crucial issue which we as designers and researchers are constantly confronted with, closely related to the issue of change. Change can basically be initiated in two ways: either as a reaction to a situation we do not like, or by acting towards a desire or an imagined situation. Strategies for change often have their foundation in problem solving, which seems to exclude desire as a valid initiator of change. In problem solving the focus is on "that-which-is (description and explanation), versus that-which-ought-to-be (ethics and morality), without consideration for that-which-is-desired (desiderata)"[40]. While the first two correspond to a descriptive and a normative change strategy respectively, the concept of desiderata is an inclusive whole of aesthetics, ethics and reason. Desiderata is about what we intend the world to be – the voice of design.

The degree of situatedness

Design in the disability area enlightens the influence of differences between the designer's and the user's worlds of concepts. The greater they are, the greater is the need for a user-adjoining design process, and the greater the applicability of the statement, "You cannot know until you have tried" [21]. A communication artifact for differently abled people resulting from a design process is supposed to represent distributed cognition not only to the designer but to the differently abled user as well [20]. This strengthens the need for situatedness in the design process.

CONCLUSION

To be *situated* in the design process can be understood through the five dimensions just presented. You need to immerse yourself into concrete experiences – not only base your understanding on abstract understanding. You need to accept and acknowledge the existence of different communities of practice. You need to allow disturbances to enter into the users' and your own worldview, to be inspired and not only informed through observation. You need to accept desire as an initiator of change. Desire can only be discovered by engaging users in the design process and engaging yourself in the situation of the users – being situated.

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