Design Space Exploration

co-operative creation of proposals for desired interactions with future artefacts

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Avhandling som med tillstånd av Kungliga Tekniska högskolan
framlägges till offentlig granskning för avläggande av filosofie doktorsexamen
fredagen den 6 november 2009 kl 10.00 i sal F3, Lindstedtsvägen 26,
Kungliga Tekniska högskolan, Stockholm.

TRITA-CSC-A 2009:17
ISSN-1653-5723
ISRN–KTH/CSC/A--09/17-SE
ISBN 978-91-7415-445-0

Abstract

This thesis critically reflects on co-operative design workshops that I have conducted. The basic method used in these workshops draws on the participants' embodied knowing. In the over twenty workshops that are analysed here a wide range of participants have been involved: family members, employees, persons with disabilities, and other stakeholders like manufacturers, service providers and civil servants. The topics have varied, but they have mostly been related to ICT products and services. Most of the workshops were conducted within various research projects.

In order to analyse this diverse range of workshops I use several different theories and concepts. I articulate and analyse the design aspects of the activities by using established design theories and concepts. The conceptual tool *design space*, meaning all possible design proposals, is used for understanding the design process. I also use theories from other fields in order to analyse three different aspects of the workshops: *the participants' activities, the designers' responsibility,* and *the process*. To analyse the way that the participants co-operatively create knowledge, *theories of interpersonal actions* are used; to analyse the work done by the designer/conductor, *theories of frames* are used; and to analyse the process, the theory of *actualisation and realisation* is used.

During the workshops the participants co-operatively make scenarios, props and video prototypes in order to create proposals for desired interactions with future artefacts.

Contributions include accounts of critical situations during the workshops and suggested strategies for dealing with them. Some implications are relevant to the design field in general, for example the importance of a process where the participants trust each other, learn from each other and work effectively with difficult issues by creating multiple proposals that facilitate understanding of the design space. I also offer arguments about why it is better to see activities, props and prototypes as mainly constitutive rather than as only representative.

Video prototypes on DVD and seven publications are included in the thesis.

Keywords:

Design process, co-operative design, participatory design, prototype, video prototype, attention, industrial design, design space, prop

Design Space Exploration -
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Colophon
This text in this thesis is set in Adobe Minion Pro, designed by
Robert Slimbach 1990 for Adobe.

Headings are set in FF Meta, designed by Erik Spiekermann 1986.

The lay-out is designed by me, done in Adobe InDesign on a MacBook Pro and output as PDF.

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Paper version: Digital printing by US–AB, Stockholm.
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Videos are recorded on DV tape mostly by the participants in the workshop, imported in Apple Final Cut and iMovie. The DVD master is created in Apple iDVD and produced by US–AB.

The photos are mostly screenshots from the videos. Curve and colours are adjusted for printing in Adobe Photoshop.

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Acknowledgements

First of all I am very grateful to all the participants in the workshops who have contributed so much fascinating knowledge and activity. It has been a true privilege for me to take part in these events.

Furthermore I wish to thank my research colleagues at the Centre for User-Oriented IT Design (CID) and HCI at Kungliga Tekniska högskolan (KTH) in Stockholm, especially Sinna Lindquist, Helena Tobiasson, Rósa Guðjónsdóttir, Björn Eiderbäck, Björn Thuresson, Yngve Sundblad, Minna Räsänen and Charlie Gullström.

I appreciate financial support from several sources. The EU provided funding for the research projects interLiving, Nepomuk, and MonAmi. The Stockholm County Police for K. Several organizations commissioned workshops: Hjälpmedelsinstitutet, the Interactive Institute, Konsumentrådet, the DigitalTV Kommisionen, Handikappförbunden (HSO), Handisam, and the European Commision – ICT for Inclusion – H3.

I also wish to thank everyone who has been involved in my work with this thesis, both for support in understanding the genre as such, and in the actual writing. First, I thank my tutors Yngve Sundblad and Peter Ullmark. Many other persons have also provided great support, among them Klaus Krippendorff, Bo Helgeson, Sinna Lindquist, Sara Ilstedt Hjelm, Åke Walldius, Håkan Edeholt, Jens Cavallin, other research colleagues at CID and HCI at CSC, KTH, at IKD at HiK and colleagues in the Swedish national design doctoral school, the Design faculty (D!). Many thanks to Helen Snively who did a fantastic job of correcting the language. Finally, Kalmar University who also provided financial support, and especially all the personal support from Henriette Koblanck.

Despite all this help any mistakes or lack of clarity are totally my responsibility.

Last but not least I thank my family, Ann-Cathrine, Vanja and William, for putting up with me during my work with this thesis.

Stockholm, September 2009

Bo Westerlund

Contents

Introduction

In this part's first chapter I give accounts of my personal experience, practice, and inspiration, as well as my aim for this thesis. The second chapter contains an overview of the thesis.

Inspiration, aim and approach

My inspiration

Some years ago when a colleague and I ran a design consultancy, Industridesignbyrån, one of our assignments was to design a toothpick holder for people with weak hands. A company that produced plastic toothpicks had learned that people with various diseases, for example rheumatism, take several medications, which is often bad for their teeth. These persons also have difficulty taking care of their oral hygiene by themselves because their hands are weak and stiff. The aim for us as industrial designers was to make it easier and more comfortable for those persons to also use toothpicks when cleaning their teeth.

We started to work on an idea for a sort of pliers that would extend and enlarge the small and thin toothpicks. We had to create something that would afford both reaching into the back of the mouth, and also provide them a better grip.

In addition to the cleaning activity, the holder also had to afford the user to insert and change the small toothpicks. We thought it might be problematic for the users with weak hands to open the grip in order to change the toothpick. We had been testing several models ourselves, trying to imagine what it would be like to use the handle and change toothpicks with weak, and otherwise disabled hands.

We realised that we did not have enough knowledge about the difficulties we might encounter during the design work; therefore we arranged for a group of persons with varying disabilities in their hands to help us by testing our ideas and prototypes.

One day we took our rough prototypes and visited the persons who had volunteered to test them. We visited the persons one by one in their homes or workplaces in order to learn from them how the different prototypes worked. Before the tests we set up a video camera so that later we could study how they handled our prototypes.

I still remember my total surprise when a woman laid a prototype of the handle on the table and quickly and with no problem at all pushed it open with her elbow and changed the toothpick with her free hand. In my thoughts about how the handle could be used, this unorthodox and creative approach had never occurred to me.

I was fascinated by how the woman seemed to have an immediate and intuitive strategy for handling the prototype. She had crucial experience that we designers lacked and I recognised some of the limitations with what we might see as the ‘traditional design process’

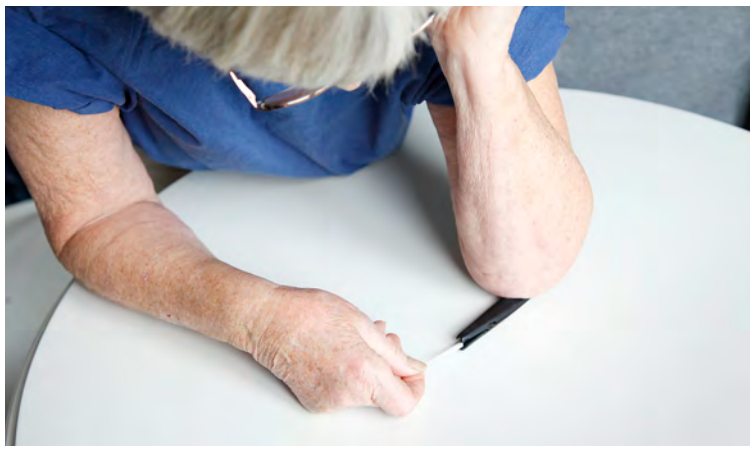


Figure 1. Changing toothpick with an elbow on the toothpick handle. (The photo is a reconstruction with the serial produced toothpick holder.)

where the designer, as the expert, stays in his atelier until the proposal is finished.

We gratefully realised, and learned the importance of, early *prototype testing* with prospective users (Westerlund 2007b:57).

A few years later I attended a lecture at KTH when Richard Mander visited as a liaison for the Apple Interface Design Project 1994. He talked about the *blank model* method (Mander & Arent 1993, 1994). This model can be a neutral piece of painted wood that is handed to a prospective user in a context that is familiar to him or her. The user is asked to explain what type of artefact might be useful to have for the moment. He or she takes the blank model, adds 'buttons', 'screens' and whatever else is needed in order to make the artefact work in the desired way. See figure 2.

Interacting with the blank model lets the user explore the possibilities and, articulate needs and desires both visually and verbally.

Between 2000 and 2003 I worked with the interLiving[1] research project which had a co-operative design approach. It aimed to design technology to enhance communication between family members of different generations. We used several different methods and techniques to gain information and understanding of the various persons' contexts, situations, needs and desires. The project was conducted by researchers in Paris as well as in Stockholm, at the Centre for User

1 http://interliving.kth.se

Figure 2. A blank model is deliberately left 'open' so that prospective users can add controls and other things they need in order to show desired interaction. (The photo is a reconstruction.)

Oriented IT Design (CID) at the Royal Institute of Technology (KTH) in Stockholm.

Early in the project, Wendy Mackay (1988, 1999, 2000) introduced a workshop method where the participants co-operatively create *video prototypes*. These workshops generate great enthusiasm, and the video prototypes are descriptions of future uses of artefacts, grounded in the participants' personal experience.

Briefly, the workshop method proceeds as follows. First, the participants account for important events, situations and perhaps breakdowns that they have encountered recently. The *critical incident technique* (Flanagan 1954) is used loosely. Based on these stories they then co-operatively envision how those situations might be improved. They create detailed scenarios of those improved situations, and create the necessary artefacts. Then they stage the scenarios with the help of the artefacts. The participants act and record the stories on video. These video prototypes show desirable and articulated interactions with future artefacts.

The three methods that I have described briefly so far (*prototype testing, blank model* and *video prototype workshop*) increased my interest in the relationships between designers and prospective users. This has had a crucial impact on my professional development and designerly approach.

The two methods of *blank model* and *video prototype workshop* put the prospective user in the position of an active participant in the design process. They both invite prospective users to participate and involve them in exploring through activity that is tightly coupled to particular situations and contexts. By doing so, the methods benefit from the participants' prior experience to support the creation of proposals for desirable interactions. This supports the work on everyday issues, and discussing these with the users' own concepts and values. Because of this strong focus on activity the communication is not only limited to verbal and visual communication.

The *video prototype method* differs from the *blank model method* because of the interaction between several participants. This co-operative element in the process seems to strengthen the exploration, and this phenomenon particularly interests me.

Together with my colleagues at CID/HCI at CSC, KTH I have conducted over twenty of these workshops with a variety of participants, e.g. family members, employees, persons with disabilities, and other stakeholders like manufacturers, service providers, politicians and civil servants. We call the method *reality-based video prototyping workshops* in order to indicate that they are based on the participants' experienced realities. Our ways of conducting the workshops have developed over time as we have gained experience and explored various contexts. Now, we also encourage other stakeholders to participate together with the end-users. The workshop method is thoroughly described on page 55 ff, *A typical reality-based prototyping workshop*.

Around twenty of these workshops provide the empirical material used in this thesis.

Figures 3 & 4. The photos show family members and researcher recording a video prototype during a workshop in the interLiving project. The photo on the right is a screenshot from the video prototype.

My aim

The basic aim with this thesis is to account for, analyse and critically reflect on what goes on during the *reality-based video prototyping workshops*. From here on I will use the simpler term *workshops* when I refer to them. I aim to show what it is possible to learn and do by co-operating with a number of participants during a workshop, and give examples of how the workshops can enhance the understanding of the possible future situations of use, i.e. to learn about the *design space* (Westerlund 2005a – Publication 2).

Throughout this thesis, I present and analyse the activities of the participants and the researchers, and present various kinds of results. I am interested not only in what seems to work well but also in the activities and results that do not work so well, when judged by some conditions. My reflections on these experiences create differences that I then analyse; the results of those analyses help me to identify critically important aspects and situations in relation to the workshops. This process allows me to propose approaches and topics where the method seems to work well, and also strategies for choosing which kind of narrations and activities to promote in order to take advantage of the method in practice.

I also aim to describe how these activities relate to design work at large, and the 'implications for design' that can be learned from this thesis.

My designerly approach

The workshops are events that I have experienced myself, and know how to practice. In writing this thesis I am shifting my position: instead of being *within* the design process, and conducting workshops, I am reflecting *on* and revisiting them in order to create new understanding regarding the method, the results of the workshops, and design work at large.

In order to understand and account for these rather complex activities, I choose to focus initially on three aspects for which I develop accounts. The aspects are: the participants' collaborative activities, the designers' activities that support the workshops' aims, and the processes during the workshops. I focus on each aspect by using established theories to generate questions about and analyse the workshop activities.

Finally I reflect on issues from these three analyses, which I then connect with other theories that I account for in this thesis.

My approach is to illustrate and account for the method and the actual workshops in several ways, which do not constitute one coherent theory. My hope is that you, the reader, can make use of these accounts and reflect on them with your own experience. And through this analogy, I hope you can create knowledge that you can use while conducting and preparing for co-operative design work in the future.

Overview of the thesis

This thesis consists of eight *chapters* summarising, extending and putting into context seven *publications* and *video prototypes* that are integrated.

Parts and chapters

The eight chapters are organised into four parts: *Introduction, Background, Aspects* and *Reflection*. At the end of the thesis is a list with definitions of some of the *Concepts used,* as well as the *Bibliography.*

The first chapter of the *Introduction* contained accounts of my *inspiration* and my *aim*. The second chapter is this *overview of the whole thesis*. I briefly describe the seven publications with respect to their contribution to the thesis. I highlight the parts of their content that are most relevant for this overarching text so that the reader can benefit from the publications without going deeper into them. I also include some reflections on aspects that in hindsight might be seen as shortcomings in the publications. I also describe the DVD that includes some of the results from the workshops described and analysed in the thesis. These are *video prototypes*.

The *Background* contains two chapters. The first, *Context of the research,* provides a short overview of some current participatory design methods and activities as well as theoretical accounts of design. Most of the theories that I rely on are briefly described in this chapter but I also introduce some theories in the various *Aspects* chapters. I describe most of the theories rather briefly because I assume that the most of the assumed readers are familiar with them. I also discuss knowledge and knowing in relation to design and practice.

The empirical material is described in the following chapter where I try to reconstruct *A typical reality-based video prototyping workshop* in the first part. Then I explain the difference between these workshops and related methods. Last come descriptions of particular issues in relation to the actual workshops that have been conducted. Examples include how participants were recruited and the topics that were worked on.

The third part, *Aspects*, is central. Although my overall aim is to provide accounts for the workshops as a unified experience and practice, the approach I use here is to analyse three aspects of the activities that constitute the workshops. These aspects are: the participants' collaborative activities, the designers' activities that support the workshops'

aims, and the processes during the workshops. I use established theoretical approaches to generate questions that I then use to discuss the three aspects of the activities that occur during the workshops.

In the chapter on *Co-operative learning* I focus on the participants' joint dialogical activities and their mutual learning. I discuss, the various stories and scenarios that are narrated. I also discuss how the participants collaborate in order to deal with the sometimes overwhelming complexity at hand.

The concept of *frames* is an essential issue in the chapter on *Attention* since it seems that the participants' frames are of great importance in supporting the participants' creative work and ensuring that they have a successful process. I also discuss the many issues that designers must attend to during the work.

The chapter on *Actualisation* elaborates on the nature of the work done during the workshops. It also includes accounts of the importance of activities, props and prototypes in creating proposals that are regarded as relevant.

In the fourth part, *Reflections*, I create connections between the different aspects addressed in the rest of the thesis. I reflect on the aspects that I judge to be critically important, and connect them into a few overall views on the workshop activities and results.

At the end is a list with definitions of some of the *Concepts used* in this thesis, along with the *Bibliography*.

Video prototypes, DVD contents

A DVD video accompanies the printed thesis as an integral part of it. It contains the twelve video prototypes that are used in the textual discussions and also the video Publication 3, which is video number 1. This video is eight minutes long; the video prototypes themselves are shorter.

The video prototypes that are included are chosen in order to illustrate and clarify several different aspects of the workshop method. All but one of them are 'authentic', meaning that they are shown exactly the way they were recorded during the workshop, except that I have removed the participants' names, which are normally written at the end of the video prototypes.

The video prototype *Nagging device* (Tjatapparat) was re-recorded before the workshops were published, since the woman who originally acted in the video did not want it to be shown. I made this video

prototype; however, the overall idea and sequence is the same as the 'original' one that was shot at the workshop.

The videos included:

1 Reality-based video prototyping, 8:30 (Publication 3), page 55.
2 Ingrid does not see the sum she has chosen, and Ingrid has 500 as the preferred withdrawal sum on her card, 1:00, page 72.
3 Lego remote control, 2:20, page 73.
4 Buying bedclothes, 4:30, page 75.
5 Chipped, including Bag finder, Wallet with sender, and Chipped moose search, 3:30, page 78.
6 Ragnar sells a sofa, 2:20, page 88.
7 Nagging device, 0:30, page 89.
8 Happy company, without disturbance, 2:10, page 91.
9 Gas alarm, 0:30, page 94.
10 Wireless screen, 1:00, page 104.
11 Integrated headset, 1:00, page 104.
12 Shopping at the café, 1:30, page 107.
13 Relieving pressure, 2:00, page 111.

Publications

The following section includes short descriptions of the seven publications that are part of this thesis; they are included again at the very end of the thesis. Here I highlight the parts that are relevant for the summarising chapters so that the reader can benefit from them without reading the publications.

Publication 1. How can stories get translated into future artefacts?
Westerlund, Bo (2006). How can stories get translated into future artefacts? In *Proceedings of Wonderground, 2006 Design Research Society Conference*, Ken Friedman, Terrence Love, Eduardo Côrte-Real and Chris Rust (eds.), Instituto de Artes Visuais, Lisbon 1–4 November 2006. http://www.iade.pt/drs2006/wonderground/ Paper 0160

This paper describes how the workshop method supports users not only in *talking*, but also in *doing* acting and *making* lo-fi prototypes, and the importance of a generative method (Sanders & Dandavate 1999).

It also includes discussions of the *espoused theory* and 'actual' *theories-in-use* (Agyris & Schön 1974).

The approaches used in this paper are expanded throughout most of the thesis.

Publication 2. Design space conceptual tool - grasping the design process
Westerlund, Bo (2005). Design space conceptual tool - grasping the design process. In *Proceedings of Nordes, the Nordic Design Research Conference, 'In the Making'*, Nordes, Copenhagen, May 29–31, 2005. http://www.nordes.org

This paper describes an alternative and relatively simple model of the design process that can be used as a conceptual tool for designing a design process. Three different examples are used to test and demonstrate the model's relevance. This model takes a quite unusual turn on the process: instead of describing the process as if it started from a problem, it suggests that in fact, it is the solutions that are actively used when designing. These possible solutions are referred to as the *design space*. The paper also provides a methodological framework for understanding the different approaches for using methods. Here the concepts *explorative* and *experimental* are essential. Finally some aspects of *constraints* are discussed in relation to the design space.

The model can be used for reflecting on as well as designing design processes in education, in research, and in commercial applications. It also pushes the concept of wholeness further than Publication 7.

Design space is a fundamental concept in this thesis, and this model is further explored in most of the chapters.

Publication 3. Video 1, Reality–based video prototyping
Westerlund, Bo and Sinna Lindquist (2005a) Reality–based video prototyping. Video presentation in *Extended abstracts, 9th European Conference on Computer-Supported Cooperative Work, ECSCW'05*, 18–22 September 2005, Paris, Dordrecht: Springer, 137–139

This is an eight-minute long video documentary that gives a good account of the video prototyping workshop method we use. The actual workshop recorded on the video is the second of two workshops that explored ways that sign speakers can use mobile video telephony. The participants were signers (people who use sign language to communicate) and other relevant stakeholders interested in mobile video telephony. Sinna Lindquist and I conducted the workshops in December 2004 and Ann-Cathrine Andersson shot the video. I edited the video and wrote the text for the voiceover. Bart van der Gaag did the narration.

The workshops lasted for five hours each and had around twenty-five participants. During the two workshops the participants created fourteen video prototypes.

When we submitted the video to the ECSCW'05 conference we needed to give the video a name. We decided on *reality–based* since

the foundation for the workshop is the participants' experienced reality, and *video prototype* since this is the main driving force, and the outcome. Out of the fourteen video prototypes that were created, we chose to show two, *Wireless screen* and *Integrated headset*, because they were the ones that were most closely related to computer-supported cooperative work (CSCW).

This video and one of the video prototypes from the same workshop series are also published in *Designing with Video* by Salu Ylirisku and Jacob Buur (2007).

The two workshops, along with documentation, were commissioned by Hjälpmedelsinstitutet (the Swedish Institute of Assistive Technology) as a part of the project Bättre tillsammans (Better together). A Swedish version of the video was published together with hands-on descriptions on how to conduct this kind of workshop. This version includes sign language translations, all fourteen video prototypes, and also video prototypes from the workshops with adults with ADHD, Attention-Deficit/Hyperactivity Disorder (Westerlund & Lindquist 2005c). An English version of this text is available (Lindquist, Westerlund & Sundblad 2006).

This video gives a good account of the 'atmosphere' during the workshops.

Publication 4. Co-designing methods for designing with and for families. Westerlund, Bo, Sinna Lindquist, Wendy Mackay, & Yngve Sundblad (2003) Co-designing methods for designing with and for families. In *Proceedings of 5th European Academy of Design Conference,* Barcelona, 28–30 April 2003, http://www.ub.es/5ead/ 'The user centred approach'.

This paper was mostly written by Sinna Lindquist and me. Yngve Sundblad and Wendy Mackay both offered valuable reflections.

The paper describes the way in which family members were involved in the interLiving project, which aimed at designing technology to enhance communication between family members of different generations between ages 1 and 76. This called for the use of several different methods and techniques in order to get information about and understanding of the various persons' needs and desires.

Since we had no specific solution or technology in mind from the beginning, we used several different methods in combination to investigate what had meaning to the family members. The methods included cultural probes, interviews, observations, workshops, video brainstorming, prototyping in the homes, technology probes and individual assignments.

This way of "using more than one research approach to address the same question" (Mackay & Fayard 1997:231) is described as triangulation, and here the *triangulation* was also across several disciplines.

The researchers had various academic backgrounds, mainly ethnography, industrial design, interaction design, psychology and computer science. To minimize the problem of 'handing over' information, researchers from at least two different backgrounds participated in each piece of work done together with the families. This means that the researchers created shared experiences of the events and activities. This not only proved to be a great advantage when discussing issues 'back at the lab'; it also meant that we all heard the answers to the other researchers' questions.

The concept of *design space* is not used with the same meaning as in Publication 2 and in the summarising chapters. In this paper it merely means the proposals that were temporarily our focus.

The approaches in this paper are expanded throughout most of the thesis.

Publication 5. Design of communication interfaces together with family members in interLiving

Westerlund, Bo (2006) Design of communication interfaces together with family members in interLiving. In *i-com, Zeitschrift für interaktive und kooperative Medien,* Volume 5 | Issue 1/2006, pp. 54–58.

The paper focuses on the design and iterations of the InkPad prototype in the interLiving project. It also gives an overview of all the co-operative design work in the project.

This paper provides some of the context where the workshops are carried out.

Publication 6. Technology Probes

Hutchinson, H., W. Mackay, B. Westerlund, B. Bederson, A. Druin, C. Plaisant, M. Beaudouin-Lafon, S. Conversy, H. Evans, H. Hansen, N. Roussel, B. Eiderbäck, S. Lindquist, Y. Sundblad. (2003) Technology probes: inspiring design for and with families. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Fort Lauderdale, April 2003, New York, N.Y.: ACM Press. pp. 17–24.

This is a paper on exploratory work with technology that is created and used for the sake of learning. The probes are not to be considered as artefacts that will be developed into products themselves.

My contributions to the paper are mostly design aspects. For example, "There is no delete function – users add to existing notes, create new ones, and move old ones. Our first design included these features, plus time and date information for each message. However,

we wanted the probe to feel different from a 'regular' computer, so we took away common visual computer signs, like title bars, borders, bad typography, symbols to click on, etc. After much design work and several iterations, there were no longer any complicated interactions or dialog boxes" (:20).

In the work that the paper builds on I took part in the design, installation, implementation, follow-up interviews and workshop.

This paper provides an account of a complementary method to the workshops, one that also has a very open approach.

Publication 7. Form is Function

Westerlund, Bo (2002). Form is function. In *Proceedings of the 4th Conference on Designing interactive Systems: Processes, Practices, Methods, and Techniques* (London, June 25–28, 2002). DIS '02. New York, NY,: ACM, pp. 117–124.

The paper focuses on the wholeness of experiences: that 'form' and 'content' are inseparable from each other. The paper develops a view of semantics that is perhaps not wrong but slightly too narrow. This is discussed in the chapter on the *Context of the research*. The 'method' for analysis of 'expression/impression' is also rather crude. Functional analysis is a method that often seems to make the artefact into an active subject that has stable properties, which is not the case. The way I use the concept function is therefore somewhat confused and it is now painfully obvious that the concept of *affordance* is missing from the paper.

This paper provides an initial attempt to understand one's relationship to artefacts, which is expanded especially in the section on *Experience of and interaction with artefacts*, in the chapter *Context of the research*.

Delimitations

I focus on the co-operative creation of proposals during design work and the conditions that encourage that process. This means that I do not emphasise design at large, like business aspects or issues of production. To a large extent I also do not discuss issues of power, gender, capitalism and other extremely important aspects of the society at large.

Regarding power and participation I have of course been a privileged person, since I take (and am given) the authority to control the other participants.

This thesis is based on work done in a European and mostly Swedish context.

Conventions

Where examples are provided on the accompanying DVD this is indicated with the heading '**Video x'**. These video examples are "authentic" and lack information on their context, and most speech is in Swedish. Therefore the printed text normally first includes information about the context before the example is described. The reason for this use of 'double' examples is to enable the reader to understand the situation even without having access to the videos.

Many of the videos are referred to in several places in the thesis. But since the examples are only described in one of these places, later mentions include a reference to the page where the example is first described.

When I write "we" in conjunction with the workshops I mean myself and almost always one or two other persons working at CID/HCI at KTH. "We" is also used when I mean "we human beings", but I do not think that this will confuse you since the context of the word should make my intended meaning obvious.

When I quote from the same source several times in the same passage, I only mention the author and year of publication the first time and omit it thereafter, including in the parenthesis only the page number after a colon: (:12).

I also provide pointers to places in the thesis where related issues are mentioned or where a video prototype is described; I do this by putting 'page' in front of the page number in parenthesis: (page 12). Similarly, when I mention a video prototype, I put 'vp' before the page number of the video in parenthesis: (vp 3).

This thesis uses UK spelling throughout, but all quotes are in their original spelling.

Background

This part, which describes the background of the study, contains two chapters. The first chapter describes the context of the activities that are the subject of the thesis. It provides an overview of the relevant design fields, participatory design methods and activities, as well as some theoretical accounts of design. It also includes a discussion of processes of learning and knowing in relation to design and practice.

The empirical material is described in the following chapter which describes a 'ideal-typical' reality-based video prototyping workshop, along with the differences between these workshops and related methods. There is also information on some particular issues in relation to the actual workshops that were conducted.

Context of the research

Design fields, approaches and methods related to this thesis

Many traditions are labelled *design*. The background of this thesis is in the fields of industrial design practice and interaction design research. The overall approach understands design as *human-centred,* in the sense that the prospective users' activities are in the focus of the work. Klaus Krippendorff writes "Design concerns itself with the meanings artifacts can acquire by their users" (1995:153). This implies that it is the users who create the meaning when they use an artefact. This also implies that the designer knows this and has "a concern for what people do with artifacts" (2006:47).

Industrial design practice derives mostly from the Arts and Crafts Movement with influences from Bauhaus and also parts of marketing; later it was influenced by a strong concern for the social impacts of the trade. Manufacturers who want new products to put on the market or adjustments to current ones commission the typical design projects. Designers normally consider themselves to be the users' advocates but this perspective can result in dilemmas in relation to the client. Although most assignments are related to physical products, industrial designers are increasingly being involved in strategic development (Krippendorff 2006, Valtonen 2007).

In Sweden the company Ergonomidesign has conducted a large amount of serious design work for people involved in various skilled work, and persons with a range of disabilities. This is part of the Scandinavian tradition in industrial design.

Most teaching in the profession of industrial design involves a practice-based approach, i.e. learning-by-doing. Its design process relies on using a combination of intuition, reflection and methods. The foundation is artistic, in the sense that the primary concern throughout the process is that the users have a holistic experience; thus it can be seen as an aesthetic approach. The word artistic should not be confused with art, which typically involves a more personal approach. Design builds on *second-order understanding*, an understanding of the user's understanding (Krippendorff 2006:65). The design approach discussed here is solution oriented and can primarily "be described as an inquiry into this future situation of use" (Gedenryd 1998:157). This is not a typical engineering process, which is said to be a more structured process that departs from a description of a problem, and relies more heavily on methods and less on intuition.

Little research has been done within the industrial design field itself. People who have training in fields other than design conduct most of the research regarding design, including Schön, Margolin, Stolterman, and Gedenryd, to mention a small fraction. Their contributions are very important but the discipline would develop more if there were more scholars within the industrial design field. The few exceptions include Klaus Krippendorff, Nigel Cross, Tony Dunne and Bryan Lawson. There are also some industrial designers that recently have achieved a PhD including Håkan Edeholt, Sara Ilstedt Hjelm and Tuuli Mattelmäki to mention some that are nearby.

Research in the fields of *interaction design* and *human-computer interaction* differs from industrial design since the disciplines involved there have strong research traditions. Computer science is oriented toward technical science while psychologists and ethnographers conduct research from social science standpoints. They are all involved in creating artefacts for new information and communication technology (ICT), but some researchers in philosophical and sociological disciplines also write about some of the impacts of ICT.

In Sweden, interaction design, and the similar human-computer interaction research, is strongly influenced by the Scandinavian tradition in this field, where Susanne Bødker (Bødker et al. 1987), Pelle Ehn (1988) and many others have conducted research and published. At first, this research focused primarily on people's use of computers at work but today the engagement is broadened and covers the whole of everyday life. This design approach is normally described as being slightly more linear than in industrial design work and often starts by studying existing practice. Not only do people trained as designers conduct the research in this design tradition; more often the work is done by ethnographers, computer scientists, psychologists and people from several other disciplinary backgrounds. This research is also a great inspiration for industrial design and contibutes to the design field at large.

The impression is that this is a very diverse field of research. Yvonne Rogers says that theories from many different disciplines and context have been imported into the field but "these theoretically based approaches have had limited impact on the practice of interaction design" (2004:88). Erik Stolterman argues that in order to improve design practice, design research must be grounded in a deep understanding of the nature of that practice (2008).

Lately the field of *service design* has emerged explicitly although these aspects have been incorporated in design work since at least the 1930s

when Henry Dreyfuss designed telephones for Bell Telephone Laboratories. He understood that the physical artefact was the part of the system that the subscriber interacted with and that the "telephones are part of the integrated overall service that" the customers "purchase from the telephone company" (Dreyfuss 1955:104).

In the last decade several concepts and theories have been created that can support designers when they are designing services. One is the idea of *touchpoints* (Moggridge 2006): all the artefacts that a customer or other stakeholder meets when he or she is in contact with a service. This includes physical, virtual, written and spoken communication. In other words a touchpoint is an interface to a service. Another concept for describing these services is to separate them into *front-stage* and *back-stage* activities (Teboul 2006): "The customer experiences the service in the front stage" (:19). This could be the dining room at a restaurant including the menu and the waiters' activities, while the back stage includes the kitchen, etc.

A touchpoint or the front stage is the situation, place, communication, event or activity where people interact with the service. I will mainly use the concept *touchpoint* instead of front stage because I think that this metaphor works better. Although front stage's counterpart the back stage gives it some advantage in providing a concept for the technology or system that the user does not meet. Both touchpoint and front stage are often used in conjunction with concepts like customers and marketing. Therefore I actually prefer the concept *interface* as it is defined by Klaus Krippendorff (2006), Lucy Suchman (2007) and others who see the interface as a relation between a human and an artefact. The "human body is as much part of an interface as the artifact interacted with" (2006:79). This is analogous with touchpoint but interface normally has a stronger connotation of human *use*.

Stakeholders

Some of the design disciplines mentioned above often include "the user" or "end-user" in the process in some way. But the concept of the user is often not explicit enough and it hides the actual activities. Moreover, the use is always specific so it is far better to say that someone 'writes an email to somebody' instead of saying that someone 'uses the computer'. Klaus Krippendorff clarifies that several persons have an interest in the future product; he suggests that 'the user' should be replaced by "*networks of stakeholders*" (2006:64). Stakeholders are people who have a stake in the development. This understanding suggests that design should be seen as "a social process that relies on stakeholders with different and potentially conflicting interests."

"The polyphony of voices of all those involved needs to be embraced and listened to" (:65).

Common views on the design process

A common view of the beginning of a design process is that the designer needs to create an understanding of the users' needs. This is often referred to as gathering or finding needs. The user can also say that he or she has problems with something. The needs or problems are experienced; one experiences a desire for a difference. The key here is *difference*. The difference is a construction that depends on one's current perspective and approach. Gilles Deleuze (1994) says that the difference is not physical but virtual. This implies that one cannot simply go out and *find* or *gather* needs. The needs and desires for difference have to be imagined or created. This is very obvious but it is not always clear in design discourse in general and in the scholarly literature.

Some textbooks in design argue for a sequential approach to design. These sequences often start by putting great effort into observing and interpreting current situations and practice. This is followed by formulating a problem and identifying needs. Then some ideas are generated, and screened and so on. The beginning of a design process is sometimes described as a 'fuzzy front end' (e.g. Rhea 2003). Some scholars even tend to exclude this initial exploration from the actual design work. The design process is often illustrated and described with the help of a funnel metaphor, where many ideas are funnelled down to the one solution.

Bryan Lawson argues that such sequential models, although apparently logical, are not supported by evidence (2004:14) and that they seem to be derived only by thinking about design, not by observing or conducting design work (1997:39). Instead of a sequentially-organised design process, one should understand that design "offers an action-based method of advancing knowledge" (1997:183). Lawson's view of seeing design as a process of creating knowledge is explored and supported in this thesis.

Complex design, Wicked problems

Design often deals with complex, unstable and puzzling situations that cannot be resolved using a rational, inductive or deductive approach. Horst Rittel and Melvin Webber coined the concept *wicked problem* to describe such situations (1973).

The concept of the wicked problem is a reaction to the idea that "an idealized planning system would function" (Rittel & Webber 1973:159). Wicked problems "are inherently different from the prob-

lems that scientists and perhaps some classes of engineers deal with" (:160). They are ill-defined and their resolution can be political. Krippendorff says that they should perhaps not be regarded as problems at all, but that the wicked aspect actually can be a matter of conflicting solutions [private conversation]. Wicked problems do not have any " definitive formulation" (Rittel & Webber 1973:161), any "stopping rule" (:162) or immediate test of a proposal; that is they cannot be "true-or-false, but good-or-bad" (:162). This means that the proposal must be judged in some way, which brings us back to the designers' intuition.

Many scholars have written about the complexity, dilemmas and paradoxes of design 'problems' e.g. Krippendorff (2006), Edeholt (2004), Cross (2007), Lawson (1997), Nelson and Stolterman (2003), Rittel and Webber (1973), Schön (1983), Stolterman (2008), and Ullmark (2007). They elaborate how design deals optimistically with the complexity and the wicked problems at hand. They discuss the non-linear, seemingly non-planned approach, which leads to entire design proposals that future users and other stakeholders tend to regard as meaningful. There seems to be "a designerly approach that is practical and that *can*, despite complexity, deliver good design outcomes" (Stolterman 2008:60).

Harold Nelson and Erik Stolterman (2003:232) emphasise the need for designers to rely on a methodical approach as well as on practical, personal knowledge. The methodical and methodological approaches involve how to do things. The practical, personal approach is central to design and "requires a designer to be prepared to take action, to have a well-developed intuition, a perceptive sense of the wholeness of the situation and an ethical and aesthetic appreciation for the design situation" (:233). Intuition means knowing something without being able to justify why. This knowing is based on lived experience and is constituted in action. Donald Schön says that it "seems right to say that knowing is *in* our action" (1983:49). He coined the expression *reflection-in-action* to account for some of the knowing that designers and other practitioners show directly while working. This reflection does not have to be done in the medium of words (:56).

Håkan Edeholt describes an industrial designer as an "intuitive and pragmatic creator of proposals that have a point of departure in how it 'ought to' be. A designer uses solutions in order to test, understand and reformulate puzzling situations. The method here is a solution driven back casting" (2007:228, my translation, typography omitted). This can be seen as an *abductive* approach (described fur-

ther below) where one explores the design space by creating a range of proposals.

Abduction

Abduction is a central concept in design theory. It is a way of reasoning coined by Peirce. The other two ways of reasoning are better known: deduction and induction. In "the basic deductive method, the cycle always begins with a theory, folIowed by an experiment or test" (Mackay & Fayard 1997:226). In *deduction* one uses a *rule* on a *specific case* to achieve a *result* (Kjørup 2004:54). This is the way a typical engineer reasons. Rules are used.

The purpose of the *inductive* model of reasoning "is to construct the best description (as opposed to explanation) of the real world. In contrast to the Deductive Model, the Inductive Model begins with natural phenomena observed in the real world" (Mackay & Fayard 1997:226). In induction several *specific cases* and their *results* are used to create a *rule*. The underlying idea is that one can conclude a probable result by having observed several similar events. This way of reasoning is often used in science. Rules are identified.

In *abduction* the *result* and the different *rules* are used to understand the *specific case* (Kjørup 2004:55). According to Nigel Cross (1982), abduction is one central aspect of a *designerly* way of reasoning. He explains the concept: "abduction merely suggests that something may be" (Cross 2007:37). Abduction makes it possible to infer the explanation from the observation.

We observe: 'Here are deep footsteps in the snow.'
We know: 'Heavy men make deep footsteps in snow.'
We draw the conclusion: 'A heavy man must have walked here.'
(Kjørup 2004:56 my translation).

Something else could have made the footsteps; therefore this conclusion could not have been deduced, and this also means that this conclusion is not strictly true. In abduction rules are explored.

It is often the case during design work that it is not possible to create "complete information"; therefore abduction is a useful method of reasoning. Abduction can be described as making a conclusion formed on the basis of incomplete information. Although Kjørup claims that abduction leads to a probable explanation to a phenomenon (2004:55), this reasoning should be critiqued, contested, complemented and tested since it is only a likely proposition, not a valid conclusion.

Peirce insisted "on the legitimacy of abductive reasoning, and denied a sharp demarcation between the language of observation and the language of theory" (Houser & Kloesel 1992:xxxiv).

Exploration of design space

In my Publication 2 (Westerlund 2005a), I propose a model of the design process that can be used both for designing and understanding design processes. In the model, *design space* is used as a conceptual tool. Here, the design space is understood as all the possible design solutions that would work; that prospective users and other stakeholders would find meaningful. Many designers generate alternative ideas in order to map out the territory and identify a range of possible solutions (Lawson 1997:217). This is what I call the design space. Design space is the territory of all possible solutions.

In reality the design space is an extremely complex multi-dimensional space containing an endless number of solutions, but here only the concept is interesting. Also the initial brief, assignment or problem that is one constraint on the design space will not be stable during the process. But when using the design space model one is not interested in this kind of exactness. Rittel and Webber (1973) and Schön (1983) also show that these are not possible to establish.

In this model it is claimed that design work supports the understanding of the design space. That is, all the different methods and techniques used during the design process will result in some knowledge about the design space. If a solution seems to work, it lies within the design space. If some method shows that certain aspects will not be suitable, these are outside of the design space.

Initially, the process can be described as *exploratory*, when one is uncertain about the design space. Here one wants to be surprised by the explorations. Later on in the process when one's knowledge has increased, the work tends to be more *experimental*; one is expecting to have one's assumptions confirmed or rejected. Observations, interviews, literature reviews, etc. that are conducted during the process also help to create an understanding of the design space.

During the design process multiple proposals are created, explored and experimented with. Due to constraints in resources, time, etc. the process always needs to end with one or several proposals. I provide examples in Publication 2 (Westerlund 2005); the model of design space is also used in Publication 1 (Westerlund 2006b) and 5 (Westerlund 2006a).

Several 'other' design approaches talk of the designer having a vision that guides the work. The idea of narrowing down the amount of

ideas is also very common. Contrary to this the design space model fundamentally acknowledges and supports the understanding that there does not exist one (1) unique solution to a design project that can be found. Instead it explains and supports a more designerly way of working.

Although the concept of 'design space' is used now and then in academic literature, an exact definition is seldom provided. Sometimes the design space seems to be something that varies throughout the process, it expands and contracts. And I must confess that in Publication 4 (Westerlund et al. 2003) we use this 'variable' view of the design space. This use does not contribute to an understanding.

But most other scholars seem to use 'design space' in ways similar to what I propose above. Allan MacLean, along with others, has elaborated on the concept and sees it as "a space of possible solutions" (McKerlie & MacLean 1994:217). John Gero and Bimal Kumar (1993) focus on relating design space to the constraining variables in examples where these variables are well known; they show that the space can expand when new variables are introduced. I see no fundamental contradiction to the use of my proposed concept of 'design space'. It is clear that if the brief or assignment changes, the design space will change as well.

Design space is a fundamental concept in this thesis, and I will mainly discuss design processes with this use of the design space model, as described above and in publications 1, 2 and 5.

Responsible design practices

Many publications and projects deal with design and design work in relation to the role it can have in society. Victor Papanek (1970) showed that design itself could introduce problems into the world by proposing products that are unnecessary or difficult to use. He also discussed the uneven distribution of wealth in the world and argued that designers should be engaged in changing the developing countries as well as making ecologically responsible proposals.

Quite a few designers have been and are engaged in work that aims at improving the future for some people in a responsible way. This has concerned many different persons, employees, persons with disabilities or diseases, less priveleged, etc. in different contexts.

In the re-emerging field of *social innovation*, Colin Burns and his colleagues, among others, have coined the discipline *Transformation Design*, which conducts "new design-led approaches to complex problems" (Burns 2006:6). Transformation design is an approach where designers and other competencies create proposals where persons' and

organisations' behaviour are transformed into new practices. Democracy, Health, and Ageing projects are examples that Design Council's RED, their 'do tank', have conducted. Designers' main contributions in these user-centred approaches are looking from the point of view of the end user, making things visible and prototyping.

Similarly, John Thackara advocates in his book *In the Bubble* for a service orientation built from the bottom up. He claims that other approaches do not work "because complex systems, especially human-centred ones, won't sit still while we redesign them" (2005:213). Thackara also suggests "designing as steering more than designing as shaping" (:214) and believes we need to move from "plan to sense" (:213), and thereby supporting people to carry out their daily activities.

The traditional design process seems to end with a proposal for a physical artefact that is produced and put on the market. And although products contain more of services and some design proposals are only virtual, most of them are still seen as a final, stable result.

Cameron Tonkinwise suggests that designers should stop "to create 'once-and-for-all's," and instead "something like 'extended-designer-responsibility' is needed, where designers are required to engage with their output beyond its production and sale/use" (2003:1). In software development the approach to support tailorability can become more common also in other design work. Tailorability means that the artefact is capable of being adapted to end users' desires, that the end users themselves can customise the interactions and affordances of the artefact. This can be seen as design for design; design for ongoing change.

Participatory design approaches and methods

Some of the above accounts of design and design processes relate to the idea of one professional designer conducting the work. But these concepts can also be used when dealing with a group of people who collaboratively conduct design work. This can be called co-operative design or participatory design (PD); here the overarching idea is that several prospective end-users participate together with designers and/or researchers, and have an actual influence on the design proposals. The overall reason for conducting design work with a co-operative approach is that one believes that the results will be of higher quality than with another approach. The type of results and the best way to judge them will depend on the subject, topic, etc.

One underlying assumption is that the participants have and can show different kinds of important knowledge that may be impossible or difficult to learn in other ways.

John Heron claims that research that deals with human conditions should be done not *on* but *with* people. The validity of the outcome of the research is questionable if it is not grounded in the researchers' own experience, and studied "through a full range of human sensibilities" (1996:21). "If the researchers are not subjects in their own research, they generate conclusions that are not properly grounded" (1996:21).

Other important reasons for including prospective users in the process can be political; that is, one can argue that people should have the right to participate in developing artefacts that have an impact on their lives.

Besides PD, in several other approaches the participation of those other than the design professional is central; examples are action research, interactive research, co-operative inquiry, participatory theatre and participatory video.

One of the earliest projects in the field of *participatory design* was the seminal project UTOPIA, conducted in the early 1980s. Researchers worked together with newspaper graphic workers in order to design computer-based tools for skilled workers (Bødker et al. 1987). They used low-tech prototypes of graphic workstations, printers, display layouts, mice, etc. in order to simulate and discuss possibilities and drawbacks with the emerging graphic technology. This was the birth of Co-operative Design (Sundblad 2009). The workers' trade union was involved and the project had an explicitly democratic objective. "One strong goal was to 'give the end users a voice' in design and development of computer support in work places, thus enhancing the quality of the resulting system" (Bødker & Sundblad 2008:293).

The PD approach can be used both in research projects and in commercial work. "Participatory design explicitly relies on designers and users working together to define project goals and design new technologies, attending to implications for new ways of working" (Blomberg 2009:135). Jeanette Blomberg also describes four guiding principles and practices for PD: mutual respect for different knowledge, opportunities to learn about others' domains of knowledge, joint negotiations of project goals, and tools and processes to facilitate participation. Further, she describes how the participants – including users, developers, researchers, managers, and customers – bring unique experiences and perspectives that are important to hear. She also stresses the importance of avoiding the abstract representations that she claims are common in traditional design approaches.

Action Research, also now called *Interactive Research,* is not oriented towards design the same way as PD. It is more focussed on changing situations for the participants or on research as such. Action research is often described as a perspective on how to conduct research, involving action in order to achieve change, but also to produce new knowledge (Agaard et al. 2006:13). It is conducted as cycles of action and reflection and "since these cycles of action and reflection integrate knowing and action, action research does not have to address the 'gap' between knowing and doing that befuddles so many change efforts and 'applied' research" (Reason & Bradbury 2008:1).

Co-operative inquiry was born in the 1970s with the insight that it is difficult for an outsider to conduct research into human activities. The fundamental idea is to research *with* instead of *on* people. "Co-operative inquiry involves two or more people researching a topic through their own experience of it, using a series of cycles in which they move between this experience and reflecting together on it" (Heron 1996:3). The concept of cooperative inquiry is also used by others, including Allison Druin (1999).

Participatory Video typically involves a group or community in exploring issues of concer to them by creating a film of their own. "This process can be very empowering, enabling a group or community to take action to solve their own problems and also to communicate their needs and ideas to decision-makers and/or other groups and communities. As such, PV can be a highly effective tool to engage and mobilise marginalised people and to help them implement their own forms of sustainable development based on local needs" (Lunch & Lunch 2006:10).

Participatory workshop methods are rather common within the broad field of research when design is involved and many are related to the method discussed in this thesis.

One pioneer in this field was the writer and journalist Robert Jungk who created the *Future workshop method*. He conducted his first workshop in the early 1960s. He had very strong democratic objectives for running the workshops and they were focussed on societal issues. Jungk was a victim of the Nazi regime in the 1930s and a political refugee. His aim was to empower people and "he worked to prevent the continuous colonization of the future by a tiny elite and to open up the shaping of the future to ordinary citizens" (Bell 2003:300). Jungk says that having conducted workshops with help of the future workshop method, he realised that they had made a *social*

invention (Jungk 1989:7) where citizens directly are engaged and not representatives.

The fundamental aim with the future workshop method is not to be reactive to unjustices, threatening developments and other issues that are regarded as problemetic by citizens, workers or whoever is concerned. The idea is to empower people to be "proactive: to encourage people to create their own images of the future and to design actions they can take" (Bell 2003:301).

Basically the method consists of three phases and an introduction where the aim and theme of the workshop is stated, and the schedule is clarified.

The first activity on the agenda of a future workshop is to formulate the problem, and sometime thereafter to define a goal. This is called the *critique phase*.

Thereafter comes the *fantasy phase* which involves creating a desirable vision or utopian situation.

The final phase is the *implementation phase* where the participants discuss how to move from the present situation to the desired future.

The workshops should last for three days. They have a facilitator who keeps track of the time and also strives "to establish an informal and open atmosphere receptive to everyone's ideas" (Bell 2001:302).

Robert Jungk and Norbert Müllert wrote the book *Zukunftswerstätten* in 1981 which was translated into Danish, *Håndbok i Fremtidsværksteder*, in 1984 and into English, *Future Workshops*, in 1987.

Finn Kensing and Kim Halskov Madsen (1991) suggested the Future Workshop method could be used in order to support the generation of visions for future use of computers" (1991:155) since the user-designer cooperation was poorly supported by contemporary methods. They realised that the use of everyday language and actual users instead of average ones supported users to take part in the design process.

Michael Muller describes the commonalities of various workshop approaches: "Each workshop brings together diverse participants to do common work, to produce common outcomes, and to develop a plan of joint action. They are thus opportunities that require mutual education, negotiation, creation of understanding, and development of shared commitments." And that the " combination of diverse voices leads to syntheses of perspectives and knowledges" (2003:1056).

Since workshops often are used in order to explore future situations and activities, they often involve techniques for envisioning desired opportunities as in design games (Ehn & Kyng 1991). In the UTOPIA project during the 80s a paper box with the text "desktop

laser printer" was used in order to envision possible future work practice (:171). This use of mock-ups had already been used in industrial design for decades but was brought into the field of designing computer systems thanks to UTOPIA.

Some workshop methods are more oriented towards games and play, for example those developed by Brandt (2006), Buur et al. (2000), and Habraken (1988), while others focus on using generative tools and material (e.g. Sanders et al. 1999, 2008) or on free brainstorming (e.g. Ylirisku & Buur 2007).

Narratives are fundamental to humans in making activities and artefacts meaningful by describing context, aims, values and other aspects that one regards as important. There are many different ways of looking upon and describing the rich field of people giving accounts for lived or made-up experiences through language. Klaus Krippendorff discusses the importance narratives have as embodied in peoples' practices of living; he outlines five components common to most narratives that concern artefacts (2006:171). They typically start with an abstract, explaining what the story is about. Then follows an orientation where the context and people involved are described. After that comes a narrative sequencing of the actual activities and events. This is often the main part and the temporal order of events is normally accounted for. The story then focuses on the lessons learned, and an evaluation, before the story is opened so that the listener can return to the present world (Krippendorff 2006:171).

S*torytelling* is a powerfully simple activity where people tell a story using words and actions, with the aim of encouraging the listeners to interact by remembering and telling related stories (Heron 2008:372). The concept of storytelling is also frequently used in marketing work.

Scenarios are narratives that include a person, goals, settings, actions and events where the person fulfils the goal (Carroll 2000).

Experience of and interaction with artefacts

Humans are supported by, surrounded by, and constrained by artefacts, which they make use of more or less continuously. Persons participate in most of these interactions without being actively aware of the artefacts. For example, when I get a cup of espresso I do not have to interrupt my conversations in order to handle the coffee, cup, spoon and plate. Persons often use things in order to accomplish something that has more of our focus for the moment, like the coffee itself or the conversation with the barista.

Persons engage with and rely on artefacts and life would be difficult or even impossible without them. People who wear eyeglasses integrate them so thoroughly into their everyday use that they probably feel less 'oneself' without them. The same normally goes for clothes, printed matter, telephones, TVs, etc. These products enable, support, and liberate persons to achieve goals, move, communicate, learn and see things that could not be done without the artefacts. Peter-Paul Verbeek says that the way *artefacts mediate our access* to the world has an impact on our experience. Telescopes, automobiles and airplanes afford experiences that we could not have without these artefacts (2005:119).

On the other hand, Verbeek says, *artefacts can mediate our existence*; thereby they have an impact on the way we choose to organize our days and our relationships. Perhaps we take a seat in front of the TV at the same time every evening in order to watch the news. Cars and airplanes have implications for the ways that persons organize their social relations (:119).

People assemble and create new artefacts from material that they have available. This is an ongoing activity that we engage in as Homo Faber, the making human. People configure and reconfigure things in ways that they hope will support their desires and aims. On the other hand, when people encounter artefacts, the artefacts also afford opportunities to interface with them. They afford interaction.

James Gibson coined the concept *affordance* in order to describe what living creatures understand they can do with some thing (1979). Affordances are properties of the object or artefact in relation to someone's understanding on a given occasion. This means that affordances are not universal. Pilots can understand some piece of land as 'landable' since that land affords the pilot the opportunity to land his plane there. The same piece of land can afford a farmer the opportunity to grow something on it, or a sheep the chance to eat the nice grass that grows there.

Some artefacts need prior knowledge in order to be understood, especially those that are part of larger systems, like mail. Gibson writes: "I prefer to say that the real postbox ... affords letter-mailing to a letter-writing human in a community with a postal system. This fact is perceived when the postbox is identified as such, and it is apprehended whether the postbox is in sight or out of sight. ... it is perceived as part of the environment..." (Gibson 1979:139). And undoubtedly, "what a computer mouse affords its user to do is learned" (Krippendorff & Butter 2007:9).

According to Gibson it is not necessary to first use language to categorize an item in order to understand what it is and to use it. Things do not have predetermined uses. A stone can be a missile that affords throwing but it can also be a bookend, a hammer, a reminder, a decoration, etc. "The theory of affordance rescues us from the philosophical muddle of assuming fixed classes of objects, each defined by its common features and then given a name. ... You do not have to classify and label things in order to perceive what they afford" (Gibson 1979:134). Further, Gibson says,

"There has been an endless debate among philosophers and psychologists as to whether values are physical or phenomenal, in the world of matter or only in the world of mind. For affordances as distinguished from values, the debate does not apply. Affordances are neither in the one world or the other inasmuch as the theory of two worlds is rejected. There is only one environment, although it contains many observers with limitless opportunities for them to live in it" (:138).

But we do share the world with others and their configurations both put *constraints* on items and provide affordances for us. A given artefact can be useful and meaningful for one person and at the same time constrain someone else's possibility of meaningful action. Thus it is obvious that different artefacts acquire different meanings when they are used by different persons. These meanings also change in different contexts on different occasions.

People engage in most of their interactions reflexively, without being aware of the interaction. We walk on floors, open doors, eat, drink, talk on the phone, write letters, draw sketches, etc. When we are engaged in such actions, we should direct our attention towards our aims. The affordances that we perceive can support activity but of course we can be wrong and think that the artefact supports activities that it does not. If we pull a door handle, and the door only can be opened by pushing, we have to engage consciously in the interaction, and might get annoyed. We encounter a *breakdown*.

We also notice artefacts for many other reasons. We might consider them exceptionally nice or ugly, or think that they are in the wrong place (Douglas 1966), for example. In Publication 7 (Westerlund 2002) I provide several examples of artefacts that attract attention.

Floors, doors, cutlery, cups, phones, computers, pencils, etc. can be designed in ways that may attract our attention, which may please us. This is often a deliberate intention, but it does not have to be. These are aesthetic experiences that one becomes aware of (Dewey 1934).

Sometimes people attribute human properties to things and can claim that an artefact has told them how it wants to be used or that it has a specific personality. This way of humanising technology, anthropomorphism, is common in everyday life but it is very questionable in the scholarly literature where one can find statements like "...devices tell us that they are..." and "Appearances can also convey ..."[2]. If this were true the artefacts would need to be able to communicate with humans or at least act as symbols, i.e. communicative signs that stand *for* something. Kjørup says that most things should not be regarded as symbolic signs (2004:50). Obviously there exist artefacts that many people regard as communicative sign, like traffic signs, signs on toilet doors, but this is not the kind of artefacts that I am discussing here.

Crilly et al. (2008) discuss if designed artefacts can be considered to be communication or not. Their main arguments against this are severe problems with containment and authorship. In the context of the current study, the critique of containment is very relevant to discussing the artefacts created during a design process. The authors write that meaning should not be seen as "contained within messages that can be sent from one party to another." Instead, they say, "critics claim that meaning is actively constructed by people and that there is no necessary correspondence between intent and response" (:435).

Many other scholars are opposed to regarding artefacts as communicative signs, as symbols. Klaus Krippendorff suggests that we "follow Wittgenstein's suggestion to locate the meaning of artefacts ... in their use ... not as referring to other things" (2006:77). He says that designers should embrace a non-representational theory of meaning. The meanings that stakeholders ascribe to artefacts are *constituted* in conjunction with the use of the artefacts. Alfred Gell claims that most artefacts should not be considered as signs in themselves since they cannot have stable meanings (1998). Here Gell obviously means symbols since he supports the use of the *indexical sign* concept in order to discuss and interpret different artefacts. In *Art and Agency* he discusses art and artefacts in museum contexts; describing the idea of index he writes that "An 'index' in Piercian semiotics is a 'natural sign', that is, an entity from which the observer can make a *causal inference* of some kind, or an inference about the intentions or capabilities of another person" (Gell 1998:13).

Thus, if one puts relevant questions to the artefact it is made into an *index*, which is a sign *of* something (Kjørup 2004:9). Footsteps in the snow can be interpreted as signs *of* someone who has walked there. Nothing is an indexical sign in itself only if someone chooses to regard something as such and decides to interpret it (:50). This makes

2 These are two quotes from a spread in a recent book on Interaction design. I do not want to name the book since it mostly is a good and clearly written book. But like many others it slips slightly when it comes to nailing down who is in charge of the creation of meaning, people or artifacts.

index a relevant concept to use for understanding relations between humans and artefacts. When we become interested in an artefact we can wonder about where it might have been manufactured, how old it is or why the designer has chosen to combine these materials and join them in this way. We choose to look at the artefact and relate what we perceive to our experience and thereby create an understanding and tentative answers to our questions. These interpretations from indexes are not established by induction or deduction but by *abduction* (see page 34).

People gain experience from interacting with artefacts and naturally use those experiences over and over again in situations with similar artefacts and similar contexts. This is true, for example, when we drink coffee out of cups and open doors. These are examples of using our embodied knowing.

Chris Argyris and Donald Schön distinguished between a person's *espoused theory,* i.e. how that person verbally explains how he or she does something, and what the person actually does in practice, i.e. the person's observed *theory-in-use* (1974). They focused on organisational contexts and part of their interest was to understand how to change someone's use, described as theory-in-use, into activities that would better fit the organisation's needs. The observed theory-in-use is similar to what I refer to here as embodied knowing.

Artefacts are also used, sometimes also created, as vehicles for communicating about something that is not easy to verbalise. Otherwise these aspects would not be available for other people's reflection. Roger Säljö uses the concept of externalisation to describe how we can communicate embodied knowing to others by creating and interacting with artefacts (2000).

This is very common in design work where artefacts such as sketches and models are fundamental in the process; they allow users to jointly reflect on and discuss ideas and communicate them to others.

Props, prototypes, models, mock-ups, sketches, blank models, etc. and their relationship to design work

During design work people need a vocabulary to be able to talk about the artefacts they are creating. They use the artefacts to explore issues and aspects of the future artefact in relation to the future situations of use. In HCI and interaction design these future artefacts are often called prototypes, and in industrial design they are often called

models, but several other concepts are also useful. Some of these are sketch, prototype, model, blank model, visiotype, mock-up, proposal, intermediary object, negotiotype, and boundary object. Some concepts are more common in some design disciplines while others are more common in others. The concepts have different intended uses, but different interpretations and definitions can apply to the same concept. This makes it difficult to use them without someone explaining how they are intended to be interpreted in the specific contexts. I elaborate a little on some of these conceptions of the artefacts created during workshops and design work to see what similarities and differences seem to exist.

Sketches are normally quick drawings done on paper but the concept is also used for simpler models, perhaps made of paper or foam. Sketching also applies to interaction and the term is used to refer to early models that involve interaction design artefacts (Buxton 2007).

Prototypes have a very wide range of meanings. In engineering and often in the context of industrial design the word is used for the final proposals, which are exactly like the future product in most ways. But in the context of HCI and interaction design "a series of quick sketches on paper can be considered a prototype; so can a detailed computer simulation" (Beaudouin-Lafon & Mackay 2003:1007). People commonly say that they work with 'lo-fi prototypes' and 'paper prototypes' (Snyder 2003). In HCI and interaction design textbooks we can read that "...a prototype is a limited representation of a design..." (Preece et al. 2002:241) and that "...a concrete representation of part or all of an interactive system" (Beaudouin-Lafon & Mackay 2003:1007).

A *model* is normally considered to be something in between a sketch and a prototype; that is, it has a great deal of fidelity regarding surface articulation but often lacks 'functionality'.

The *blank model* is a simple geometric solid or a system of geometric solids with few or no surface features (Mander & Arent 1993, 1994). It can be a piece of painted board that is used in a very exploratory way, together with prospective users. It is deliberately left 'open' so that prospective users can add features they desire. They draw with a pen on the blank model and explain the ways they could think of using it in a specific context. Thereby the users create and show the use of a desired interface (see figure 2 in the *Introduction*).

Mock-ups are often full-size models created to show and test some aspects of a developing product during its design process. "Designers

generally use 'mock-ups' as artifacts to represent early design concepts" (Mander & Arent 1993:203).

Boundary objects, in this context and according to Star and Griesemer (1989:389), are "objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. [...] They have different meanings in different social worlds..." They explain that "participants in the intersecting worlds create representations together [...] This resolution does not mean consensus. Rather, representations, or inscriptions, contain at every stage the traces of multiple viewpoints, translations and incomplete battles" (:413).

Intermediary object, according to Bojout and Blanco (2003:205) "is a conceptual framework" for involving in the design process objects "that foster co-operation". They say that such objects "are also representations. They are either representations of the product or of the design process" (:211).

Visiotypes, Negotiotypes, and *Seriotypes* are concepts that Jan Capjon (2004) suggests using together with "prototypes" when rapid prototyping (RP) is used in a design process to indicate the increasing fidelity among other aspects of the artefact. For example he suggests that when "RP technology [is] employed for production of flexible types for conceptual negotiation as demonstrated", it "should be called Negotiotyping and the involved material representations" should be called Negotiotypes (Capjon 2004:289).

Probes and *Technology probes* are normally not described as belonging to the category of prototype (Gaver & Pacenti 1999, Publication 6 (Hutchinson et al. 2003), Mattelmäki 2006) since they are not intended to be developed into future artefacts. Normally the designer is not as interested in reactions to the probes themselves but instead wants the probes to be used; their very use is of interest. The objective with the use of probes is to inspire designers in their creative process. But can this not be seen as a *learning vehicle?* According to Christiane Floyd (1984:5) these are possibly also prototypes.

In the interLiving project one of the initial Technology Probes, the messageBoard, was very much appreciated by some of the participants. It also contributed to a great deal of understanding. This inspired the design process in which it evolved into the InkPad prototype (Eiderbäck et al. 2003, Lindquist et al. 2007a; Publication 5, Westerlund 2006a).

The discussion of the probes shows that the business of categorisation is not at all trivial and as I discuss in more detail later, it seems more reasonable to focus on what the artefacts seem to *afford* instead of what category they belong to, i.e. their *name.* The categories are not stable over time and can also be interpreted differently from different standpoints.

Props originate from the theatre context; the term is short for *theatrical property*. A prop is an artefact used by an actor, which distinguishes a prop from the set decoration.

Although these concepts are not always comparable, one commonality among most of them is that the artefacts created are often described as *representations*. The artefact is seen as representing something to come. In HCI and interaction design textbooks we read that "...a prototype is a limited representation of a design..." (Preece et al. 2002:241) and "...a concrete representation of part or all of an interactive system" (Beaudouin-Lafon & Mackay 2003:1007). The use of a representational theory is also common in contemporary research discourse: "Designers generally use 'mock-ups' as artifacts to represent early design concepts" (Mander & Arent 1993:203) and as "...stylized versions of the artefact to be designed represented by simple card board or foam props..." (Brandt 2006:63).

This way of describing the artefacts used in the design work as representing something else is problematic for many reasons. This would mean that these artefacts are communicative signs, symbols, standing for something. In design work we are concerned with creating "that-which-does-not-yet-exist" (Nelson & Stolterman 2003:10). Therefore it is very difficult to understand how a prototype can be seen as representing something that does not exist.

Earlier in this part (page 44) I showed that in general artefacts should not be regarded as representations or communicative signs. This strongly supports the non-representational approach as well and suggests that we instead focus on what the prototypes afford, how they are part of the constitution of the design work, which suggests that the artefacts themselves are even more important.

This position is of fundamental importance, and will be further explored in this thesis.

The concept of design proposal

Klaus Krippendorff (2008) suggests using the concept of *design proposal,* and transfers conditions that the concept of proposal has in

speech act theory into design discourse. He argues that these conditions are necessary: they must be met in order for other stakeholders to engage in realising the proposal. He calls these five conditions *essential, preparatory, sincerity, motivational and political/societal.*

He describes what each of these conditions must do. They must:

"• Spell out what is to be done and inform recipients of the consequences to be expected from acting as proposed. (Essential conditions)
- Be commensurate with the resources recipients have available to act as proposed. (Preparatory conditions)
- Have adequate backing for the reality of the proposal. (Sincerity conditions)
- Offer meaningful possibilities that recipients can utilize. (Motivational conditions)
- Invite recipients to commit themselves to cooperate in the stakeholder network – even under adverse conditions, disruptions or opposition. (Political conditions)" (2008: unnumbered)

It is important to recognise the relational aspect of design work. Designers seldom use the products that they design, and they never create products. Producers, manufacturers, service providers and other stakeholders are the ones who produce products. That is why it is so important for designers to create proposals that others will understand and appreciate. The proposals that designers create and formulate have to communicate the necessary information to these stakeholders in order for a design idea to be actualised into a product that is available on a market or elsewhere.

The concept of *proposal* is also used by other scholars, e.g. Edeholt (2007).

Theories of processes for learning

The philosophical question of what knowing and knowledge is, together with issues of reasoning, learning, skill, etc., has been debated through history and the issue is much too large to examine in this thesis. But creating proposals for desired interaction with future artefacts involves these activities, and since we should understand design as a "method of advancing knowledge" (Lawson 1997:183), I briefly account for some positions.

There have been, and currently are, many ways to describe, categorise and conceptualise the property or activity usually called 'knowledge' or 'knowing'. Some differences depend on the scholars' backgrounds, but there is a tendency to shift from seeing knowledge

as something that people have, normally as a result of learning, to instead "focus on the systems through which knowing and doing are achieved" (Blackler 1995:1040). Having conducted an extensive study of common images of the concept of 'knowledge', Frank Blackler proposes that knowledge appropriately should be called knowing and be "analysed as an active process that is mediated, situated, provisional, pragmatic and contested..." (:1021). He sees a need for this and other new approaches in order to conceptualise "the multi-dimensional processes of knowing and doing" (:1035 italics omitted).

Bengt Molander, who has studied knowledge in action within many practices, suggests that we should not see knowledge as a thing, or a property of someone. Instead knowledge is shown in activity; therefore Molander suggests using the verb knowing (1996). Here is it useful to recall the earlier quote by Schön, that it "seems right to say that knowing is *in* our action" (1983:49).

John Heron (1996) suggests a multi-dimensional account of knowledge that is different from Blackler's. Heron suggests that besides *propositional* knowledge or descriptive knowledge, we must also acknowledge *practical*, *presentational* and *experiential* knowledge. He says that intellectual or propositional knowledge "is interdependent with three other kinds of knowledge: practical knowledge, evident in knowing how to exercise a skill; presentational knowledge, evident in intuitive grasp of the significance of imaginal patterns as expressed in graphic, plastic, moving, musical and verbal art-forms; and experiential knowledge, evident only in actual meeting and feeling the presence of some energy, entity, person, place, process or thing" (1996:33).

Storytelling, mentioned above, is an example of presentational knowledge. Heron says it "can help bring a quality of curiosity to the action phase of the inquiry. If we are not going to find out what we already know, just as we must open ourselves to new encounters and new experiences, we must be open to new stories and metaphors" (Heron 2008:372–3). He explains the interdependence between the accounts of knowledge: "We start from the position that all knowing is based in the *experiential presence* of persons in their world" (:367). Experiential knowledge supports presentational knowledge, which supports propositional or conceptual knowledge, which upholds practical knowledge, the exercise of skill (1996:33). This implies that practical knowledge completes the other three aspects.

At first sight, the accounts of Heron and Blackler differ considerably, but we must remember that they describe similar activities, but from slightly different standpoints, and perhaps values, depending on their

different backgrounds and objectives. Heron works in the context of co-operative inquiry and action research, and Blackler works in organisation studies. Therefore one difference between their perspectives may involve a shift in focus from the individual to the group. Both their standpoints are relevant in relation to the workshop methodology.

The concept of *embodied knowledge or embodied knowing* is used in this thesis to account for aspects of what the participants actively contribute during the workshops. Blackler describes embodied knowledge as "action oriented" and says it "is likely to be only partly explicit" as it "depends on peoples' physical presence, on sentient and sensory information, physical cues and face-to-face discussions, is acquired by doing, and is rooted in specific contexts" (1995:1024).

Tacit knowing is a concept that is similar to embodied knowing. The verb form, knowing, is important to emphasise the active and personal aspects of the knowledge (Molander 1996:35). Tacit knowing is useful in order to account for activities that practitioners conduct. They know more than they can express in words. The concept tacit knowing was coined by Michael Polanyi in the 1960s.

The workshop event can be seen as a *setting* that has the aim of supporting co-operative learning. Behind a setting is an idea of how the learning will be created and what is expected of the participants. The setting also includes expected power relationships between the participants (Rostvall & Selander 2008:37). The setting is constituted by the physical context, as well as the communications and actions of the persons conducting the event.

"To learn something is often to give up one form of knowledge for some other. This can be painful" (Rostvall & Selander 2008:15, my translation). An example of this can be the "theory of 'double-loop' learning [which] encourages an explicit recognition and reworking of taken-for-granted objectives" (Blackler 1995:1023). Using single-loop learning we can, for example, learn a technique for suppressing conflicts, and maintain our governing variables. But if we instead engage in double-loop learning, our governing variables are also contested, and we can learn to be concerned with the surfacing and resolution of conflict rather than just with its suppression (Argyris & Schön 1974:19).

Since this thesis includes descriptions, accounts and analyses, it is reasonable to expect it to present propositional, or descriptive, knowledge. But it becomes clear from the accounts below of the workshop method (page 55) that much of the knowledge that is discussed,

accounted for and created during the workshops is in the form of actions, presentations and embodied knowing. All of the four dimensions of knowledge that Heron acknowledges are present and crucial during the workshops and should therefore be accounted for in this thesis. But I also see that the workshop activities have a "focus on the systems through which knowing and doing are achieved", as Blackler suggests.

The issues of 'learning' and 'knowing' are very complex, and the scholars that I refer to use slightly different terminology; therefore I choose to use 'knowledge', 'learning', 'understanding' and 'knowing' as somewhat overlapping concepts in this thesis. I do not see the need to pinpoint this further since it is not the terminology that is my focus, but the account of activities. I count on you, the reader, to create a relevant understanding of the use of the concepts.

The workshop method's theoretical foundation

The theoretical foundation I choose for interpretation of the workshop method is mainly the understanding of design as *human-centred,* as described by Klaus Krippenforff (2006:39ff). *Human-centredness* is a network of interconnected concepts and theories from several fields, and in some ways resembles social constructionism. Two key concepts are recognising "the human involvement in the artifacts of design," and that acknowledging that "designers ... participate in the social construction of reality" (Krippendorff 2006:40). This implies that there is no such thing as a true, fixed and stable world 'out there' that is represented in our brains. On the contrary, the way we understand and categorise the everyday "is a product of historically and culturally specific imaginations regarding the world, and are therefore contingent." Those imaginations "are created and sustained through social interaction between persons in their daily life" (Winther Jörgensen & Phillips 1999:104, my translation).

One of the theories included in human-centeredness is Gibson's theory of *affordance* (1974), which is described above (p 42). It also includes the concept of *direct perception*, meaning that in everyday situations persons know how to act in relation to a thing without reflecting on how. This is the way persons mostly interact with artefacts. Another way to see this is that persons use their *embodied knowing* when interacting with familiar things and situations. This interaction does not need to involve verbal categorisation.

Although we say that reality is socially constructed, and that the world we inhabit is constituted in language, this does not mean that artefacts do not exist outside of language. Persons continuously in-

teract with artefacts, and may call them different things, use them for different purposes, and often not even notice them. Gibson says that "[t]here is only one environment, although it contains many observers with limitless opportunities for them to live in it" (1979:138). The key to understanding how this one and only environment can be interpreted and used in so many different ways is to understand that artefacts contain no meaning. The meaning is continuously socially constructed. Krippendorff says "[h]umans do not see and act on the physical qualities of things, but on what they mean to them" (2006:47).

Communication, languaging, understanding and constituting

Co-operative learning is constituted through social interaction that takes several forms, of which the most important is *communication*. John Stewart quotes Heidegger regarding communication; he says it is "not a matter of transporting information and experiences from the interior of one subject to the interior of the other one." Rather, it is "a matter of being-with-one-another becoming manifest in the world, specifically by way of the discovered world, which itself becomes manifest in speaking with one another" (Heidegger in Stewart 1995:110). In this context, knowledge "is different ways to act and communicate that seem stable and meaningful, and that have acquired social acknowledgment as knowledge only in a particular context" (Rostvall & Selander 2008:13 my translation).

Some theorists see the use of language as negotiations and interpretations, and not as a representation. Stewart explains how experiences cannot be represented in language, but are instead *constituted* through the dialogue because "the same phenomenon cannot be both constitutive and representational" (Stewart 1995:113). One must choose one model at a time, whether constitutive or representational, and Stewart advocates strongly for the constitutive:

"This languaging is the way humans "do" understanding and, in the process collaboratively "build," "remake," or "modify" worlds. To be a human is to be an understander, which is to engage in processes of coherence building or sense making, processes that occur communicatively and that enable humans to constitute, maintain, and develop the worlds we inhabit" (Stewart 1995:115).

My knowing in relation to the empirical work

In order to understand and account for practical knowledge, as a research outcome, the researcher has to be a co-subject in the research according to Heron; it cannot be about anyone else. The research should be done *with* the persons whose knowing and learning is of

interest, not *on* them (Heron 1996). Krippendorff supports this by explaining that "[u]nderstanding is always embodied in or enacted by people. Those who inquire into others' understanding ... must include themselves in the conversations" (2006:70).

I have been a co-subject in the workshops' learning and design processes, and part of the conversation, which means that I have personal embodied knowing in relation to the workshops.

I choose to include some of the video prototypes in the thesis, as well as to describe the activities from several perspectives, in order to support my account of many aspects, especially those that are difficult to verbalise.

Aspects of the context

This chapter has described the type of design activity that this thesis revolves around as a process of "advancing knowledge" (Lawson 1997:183). Designers create knowledge regarding the future situations of use by inquiring into these with a range of approaches, methods and techniques (Gedenryd 1998). Some of these are very common like making visual and physical artefacts to facilitate ideation, discussion and reflection. Other methods that are not as common but are central here include co-operative workshop methods. Many of these have a resemblance with Robert Jungk's Future Workshop method in the way that they typically depart from a present problematic situation and after creating ideas for a situation that is considered better, the group creates ways in which these ideas could be implemented.

The interest in the present situation differs among disciplines. Many disciplines are primarily focussed on understanding and explaining present situations and actions. While designers focus on exploring what could be considered meaningful by some people in some future context. These particular proposals are examples within the *design space*.

The conceptual tool *design space* is discussed and it will be used throughout the thesis to account for the design proposals that would be regarded as meaningful to use by some people in relevant contexts.

A typical reality-based video prototyping workshop

Every workshop that I have helped to design and conduct has been different from each other, but they also resemble one another. Here I give an account for an *ideal typical* workshop, meaning that it although the description resembles the workshops, it is fiction where certain aspects are accentuated for clarity.

The reality-based video prototyping workshop method is structured into three general phases: creating accounts of experiences, generating proposals and articulating them with video prototypes, and discussions.

The overall aim is to generate sustainable and meaningful suggestions for desired futures, to propose differences. The workshops result in proposals for desired interactions with artefacts in everyday life situations. The workshops also facilitate learning about the participants' situations and contexts on a broader level.

The workshops varied in length between two and a half and five hours. Many were conducted in our lab at the department of CID/HCI at the School for Computer Science and Communication at KTH over a period of almost ten years.

Video 1, Reality-based video prototypes

Publication 3 is a video that shows one workshop and is intended to give an overview of the method and the atmosphere during a workshop.

The video describes a cooperative design workshop on future mobile video communication for deaf people using sign language. One issue was to explore ideas for mobile services that provide interpretation-on-the-fly; how could they be designed to allow collaboration and communication? In addition to the deaf sign-language users, other stakeholders participated, for example service providers and manufacturers of mobile phones.

The workshop starts with users' narratives about their daily lives. We encourage them to describe situations requiring collaboration and communication that they had experienced as problematic. During the discussions after the stories are told, we jointly generate ideas for solutions and discuss those ideas. Then all the participants collaborate in creating video prototypes, i.e. staged and videotaped visual illustrations of the ideas for solutions. The workshop experience provides the telephone manu-

facturers, service providers, etc. with firsthand experience of the narrations and they can take the video prototypes back to their own organizations to develop them further.

Participants

We try to get a variety of people to participate in the workshops. A significant proportion of them should be intended 'end users' of the product or practice that the workshop might propose. The rest are other stakeholders of the product or activity that is in focus, as well as designers and researchers. The inclusion of stakeholders is of course something of a paradox since the participants influence the result of the workshop. And the act of excluding or inviting someone will influence whether or not they later become a stakeholder of the product. One seldom knows at the beginning exactly which people will be involved in the use and other activities concerning the future artefact, so the initial group of participants is an assumption.

The workshop participants can be co-workers at a workplace or they can be users of a specific technology, people who have some specific disability or desire. In addition to the prospective end users, other stakeholders, who may have an influence on the artefact or be influenced by it, should also participate. These stakeholders can be producers, service providers, sales persons, recyclers, etc.

We explicitly want people whose personal experience is relevant for the workshop and not representatives of the experience of others. In our experience, people who are chosen as representatives sometimes argue more on general levels. They remain detached from the experiences we want to see represented. This does not promote the focus on particular events, which we are interested in. We seldom choose the actual persons who attend the workshops; they are often chosen by others, for example an organisation for persons with disabilities. We often contact companies and organisations that we think can be stakeholders of the future product and they choose individuals from their organisation to participate.

In most cases the participants have a direct interest in the scope of the workshop. We never pay the participants but sometimes they participate during time that is paid for by their employer.

The number of participants can vary but often it is around twenty. Most of the time during the workshop we work in groups of about seven. At the beginning and end all the participants are gathered together.

Introducing and starting the workshop

When the participants arrive they are given a nametag that also has a coloured dot that shows what group they belong to. Then we inform them about the aim of the workshop and how it is structured in order to help them create relevant proposals. And we explain how we hope the result will influence stakeholders downstream and that the future products in focus can be improved.

We also explain that the contributions from all participants are important for the result and we assure everyone that nothing is 'wrong'; instead all contributions can contribute to the learning and brainstorming-like process.

We present ourselves as researchers and say that we will help out during the workshop. We ask everyone to introduce himself or herself but we do not explicitly divide people into categories like end-users or manufacturers. This becomes obvious enough during the presentation. We want all the participants to feel that they are equally important.

Some ethical issues are involved. We explain that we want to record some of the participants' work on video in order to distribute the proposals that are created. We assure them all that if someone disagrees with this we will not show the videos outside of the workshop context.

After this introduction we ask if anyone has questions. After we answer these questions the people move to sit together with their group.

Accounts of experiences

In the first group activity, the participants tell stories about recent situations or incidents that have been meaningful for them. We encourage actual descriptions of real situations that make sense to other participants as well, instead of general descriptions without detail. We loosely use the *critical incident technique* (Flanagan 1954) and ask the participants to tell us about real and recent incidents that they regard as important and meaningful. Although both desirable and problematic experiences are interesting for the process, most stories tend to concern problematic incidents.

Creating ideas and proposals

These stories trigger the rest of the group to create ideas for ways to improve the problematic situations. These ideas are grounded in the lived experiences of the participants, and they create many of them. During this discussion all subjects, situations and ideas are noted on

Post-It notes that are put on the table so that they will not be forgotten and can be recalled later.

During the end of this part of the workshop the groups have to choose one or a few ideas that they all regard as meaningful to continue to work on during the rest of the workshop. Normally this process requires supportive interference by the people running the workshop since the participants normally want to continue their discussion. They do not feel 'ready' but a designer knows that it is necessary to get involved with the ideas in order to articulate details of them that support understanding.

The ideas that the participants consider meaningful are developed into new scenarios, i.e. short stories that show how an aim is reached with the use. The ideas for improvements are used to change the initial situation into a desired one.

While the participants are creating simple prototypes and other props, they may generate even more ideas for improvements, and the initial scenario evolves as they all contribute their experiences. This is a constantly ongoing process throughout the workshop since new ideas and solutions are created throughout the work.

The participants show how they would want to use the artefacts that they have made together. They create scenarios and enact them with the help of props and prototypes. These scenarios are recorded on video, creating video prototypes: short videos that show the use of the prototypes in relevant settings. The scenes are recorded in the order they are intended to be shown and are 'cut' directly in the camera. This means that there is no need to edit the video afterwards. They are not meant to be fancy or dramatic, just to illustrate the activities in the proposed future situation of use.

Each group creates one or several video prototypes.

Presentation and reflection

Finally the work in groups ends and all participants come together to look at all the video prototypes that have been made during the workshop. The videos are shown one at a time, and after each one the creators can articulate aspects that are not clear. All the others also have an opportunity to discuss and criticise each proposal. In this phase the participants also reflect on and discuss whether the described situations and corresponding ideas for improvement might be generalised; that is, do the ideas seem to be meaningful to others as well? Conflicts of different kinds, the risk of misuse and ethical aspects can be issues as well. People's different values can surface, along with problematic

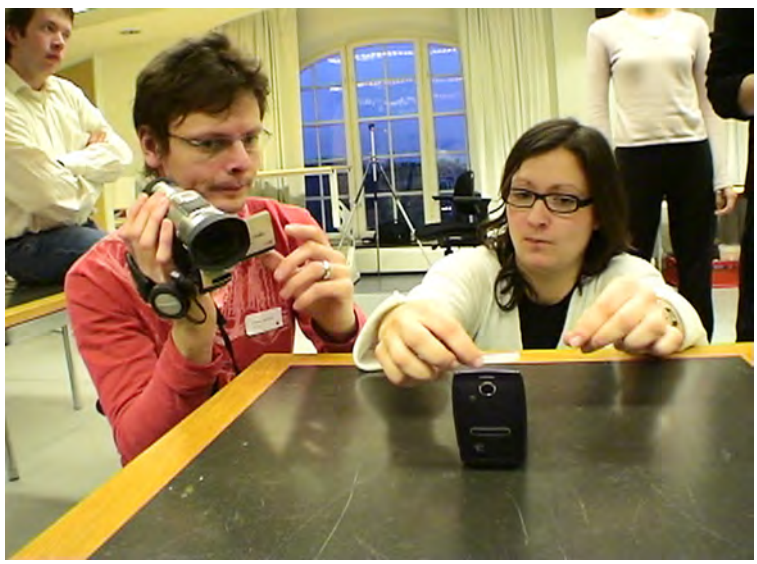
power relations. These discussions are recorded on video to facilitate reflection by the researchers afterwards.

Sometimes the ideas for solutions go well beyond the scope of the workshop and this must be acknowledged. New proposals for further improvements can also be created during the discussions.

Stakeholders coming from industry sometimes try to construct business models around the ideas; that is, they think about how to make them profitable and thus facilitate having the proposed artefact be produced. The users seldom care about these concerns but the discussions give them an understanding of the conditions that industry must consider.

Normally the same participants take part in several workshops with some time in between; this makes it possible to review and improve the ideas.

This is a short account of the workshop method. In the following I emphasise both details and actual events, and also the underlying and overarching aspects, but I will not provide much more description of the method. Such descriptions are in the publications accompanying this text, especially numbers 1, 3 and 4, and also in Lindquist (2007) and Lindquist et al. (2007), and of course in the writings of Wendy Mackay (1998, 2000). Very hands-on oriented descriptions are also available (Westerlund & Lindquist 2005c, Lindquist, Westerlund & Sundblad 2006).



What differentiates these 'reality–based video prototyping workshops' from the 'other' workshops described in the 'Context'?

Participatory workshop methods are similar in many ways and most are related to Robert Jungk's Future Workshop method (1989). But four aspects distinguish the reality–based video prototyping workshop method that is discussed here from others that are related or similar.
- The participants' embodied experience and knowledge are used explicitly. This is done through co-operation, interaction, communication and discussions among the participants.
- Relevant stakeholders participate on equal grounds.
- The method makes use of video prototypes, which forces the participants to engage with one another physically and also with the props.
- The props and scenarios are fully created by the participants in order to make their embodied knowing available for exploration as much as possible.

Some specifics of the workshops conducted

Contexts

The reality-based video prototyping workshops are often one of several methods used in a research project. There the workshops are used both to learn more about the context and the opportunities to make improvements.

Other workshops have been commissioned to critically investigate a technology for use by persons with disabilities. Then the objective is also to communicate the results to policy makers. Other workshops have been commissioned in order to promote a user-oriented methodology.

Some of the workshops have a political, democratic motive: to give voice to people who would benefit substantially from the proposed changes.

Deciding on issues to explore

The overall aim is normally set either by the person or organisation that commissions the workshops or by the researchers. But the details of what to work on during the workshops are relatively open to the participants.

Recruiting participants

Normally we do not recruit individuals to participate in the workshops. Either the persons are already participating in a research project where the workshops are one of the methods being used, or

the organisation that commissions the workshop recruits the participants. In the latter case we explain that we want persons with actual relevant experience to participate, not persons representing others.

The issue of who should participate may seem simple when I say that all stakeholders should participate so that they have the opportunity to influence the proposal. But this is a complex issue, both theoretically and in reality.

On the practical side there are always many issues, both subjective and due to circumstances beyond our control. It is difficult to run workshops with over thirty participants. The people that we want to have participate may be occupied or uninterested. Other issues are more political; for example, in hierarchical organisations it is sometimes difficult to get participants with relevant personal experience. Instead representatives for these people may show up.

On the theoretical side we will never know in advance what kind of proposals will be created and therefore we will never know who will have a stake in them. The proposals that actually are created will be influenced by the participants, which means that we have something of a Catch-22 situation. The participants and the proposals go hand in hand.

My role during the workshops

Like the other persons who prepare for and carry out the workshops, I have and take on several responsibilities, roles, and or tasks, depending on one's perspective.

We are often *researchers*, in the sense that the workshops are part of research projects. But this is definitely not research *on* the participants in the sense that we try not to interfere, and that we maintain a strict division between researcher and the object of study.

We are also *hosts* and in that sense we need to see to everyone's comfort and well-being.

We *facilitate* the workshop by providing material, tools and the method in order to support the participants. Facilitator is quite a common term for this work; e.g. see Sanders and Stappers (2008).

We are also *participants* in the sense that we co-operatively carry out the workshop and we also contribute somewhat to the work.

We are *producers* in the sense that we oversee all arrangements both before and during the workshop. But oversee also has an overly passive connotation as I see it, and seems to mostly concern engagement before the event.

We *conduct* the workshop. A music conductor supports the orchestra in performing the music with visible cues. The conductor also

has an overall aim of creating unity and an approach for the music performance. But the concept of conductor has at least two downsides. It may connote slightly too much dominance and expectations for a specific result. Other scholars use the similar concept of Maestro. Albinsson et al. (2008) positions a Maestro between an artist and a facilitator. The Maestro will "contribute ideas and help others to contribute" and "make sure that the design is a coherent whole" (Albinsson et al. 2008). For me the concept of Maestro resembles the idea of the genius, which is not relevant in this context.

Conductor can also refer to the guy on the train who takes tickets and keeps the passengers happy, and it feels this way sometimes during the workshops.

We are *pedagogues* in the sense that we provide a setting for learning, and we have an idea of what the outcome may be: not the exact outcome, but the type of knowing that could occur. The exact outcome is what the participants create and the learning they do. If we think of the current use of pedagogue, this is someone who provides settings that facilitate learning.

I am a *designer* and the workshop is a design event in itself. The workshop is also designed in many ways: the setting, the mix of stakeholders, the structure, the idea of outcome, etc. But I am not a designer in the sense that I am interested in persuading the other participants to accept my ideas. The way I am a designer is that I see and support opportunities for the participants to create what they regard as meaningful. I'm also a designer in the sense that I want to create an understanding of the design space.

None of the concepts above covers all the responsibilities, roles, and tasks that we have and take. In a sense the idea of a *conductor* covers the activities quite well in that the participants create the 'music'. The idea of being a *pedagogue* is reasonable since the participants create most of the learning. A *designer* is also reasonable since a workshop is a complex design process with many opportunities. I choose to use the terms design and conduct in order to account for the preparations, and the pedagogical and research setting needed (design), as well as the facilitation, support and production (conducting) during the process and also an overall aim and approach (design). When I use *designer/conductor* I mean a person who takes responsibility for all the activities mentioned above.

How we and the workshops are presented to the participants

Normally I conduct the workshops, along with one or two others. We present ourselves as researchers from KTH. Sometimes I say that I am an industrial designer.

We always project the agenda and talk through it step by step. One reason for doing so, except to provide the overview, is that sometimes the groups include persons with difficulty hearing. The explicit structuring of the workshop does not mean that we believe that the design process as a whole should be considered linear. It is simply a way to help the participants accomplish relevant results during the workshop itself. I will elaborate more on this below, when I discuss *attention*. (page 81)

We also show and talk through a simple picture of the intended context of the workshop (figure 6, page 84), how it fits in between the participants' experience and the availability of a market or in some other form. The process illustrates the importance of the lived experience of the 'end-user' participants, and their other knowledge. This process also includes other stakeholders like manufacturers, service providers, etc. in order to illustrate that the learning from the workshop can later be available on a market and for actual use in everyday life.

We then show a short video prototype from a previous workshop in order to give the participants an idea of the expected result. In conjunction with this we provide them some recommendations about shooting the video.

We deliberately use visuals that are seen as vernacular, that do not have an elaborated visual formulation. We normally dress rather casually as well, but we are considerate of the expected participants.

Changes in the method over time

Over time the way we conduct the workshops has changed in several ways, based on our own reflections on how we experienced the workshops but also due to different circumstances, contexts and opportunities. Initially the method consisted of more phases. These were also more distinct: generate accounts for critical incidents, use scenarios, generate ideas, brainstorm about the video, design the scenario, prototype the video, and finally present it and reflect on it.

We noticed that the participants became confused when we engaged them in both video brainstorming and video prototyping. Apparently we could not make the difference clear and meaningful for them. The double scenarios seemed to put more focus on the current situation than on future possibilities. After a few workshops we cut

down the number of steps or phases to the three described earlier. This process, with fewer steps, is what we used in most of the workshops that I reflect on in this thesis.

The participants in the initial workshops were 'end-users' and researchers. But in 2004, we were asked to organise a workshop on payment with the help of machines, for persons with disabilities; then we also invited other stakeholders, not just people with disabilities. We invited people from banks and local transport, and manufacturers of relevant machinery and software. I was first afraid that the 'end-users', the people with different disabilities, would be 'run over' by the other stakeholders. Therefore we made sure that the participants with disabilities had first say. But it turned out that this not was a big issue; instead it was very rewarding to have these stakeholders meet, share their experiences, and learn from each other. Since then, we have always strived to involve relevant stakeholders in the workshops.

Aspects of the workshops

This part has three chapters that explore aspects of the reality-based video prototyping workshop method. The first reflects on the participants' co-operative activities. The second chapter inquires into the activities of the designer/conductor, and the third elaborates on the nature of the work done during the workshops. Each chapter introduces theories that are used to generate questions that are then used to discuss and analyse the specific aspect of the activities during the workshops.

Co-operative learning among the participants

This chapter applies theories of learning, action and participation in order to reflect on the participants and their co-operative learning during the workshops. I also discuss how the participants deal with the sometimes overwhelming complexity at hand while exploring the design space.

Interpersonal actions, model I and II, and their governing variables

Chris Argyris and Donald Schön investigated interpersonal human actions in the context of organisations and other social systems (1974). They were interested in creating not only a theory for describing action, but also a theory for how to create events and actions. They proposed a theory in which these activities can be described coarsely in two different models, *model I* and *model II*. Learning is one of the key issues in their theory.

Characteristic of model I is a rational process where goals are defined early in the process and the task is strictly controlled with little public testing (:63 ff). "People who behave according to model I tend to develop group norms to support the model – for example, in the form of organizational structures and policies" (:84). Model I "consists of competitive, win/lose, rational, and diplomatic behavior that is self-sealing; this last property is the most significant because it prevents the improvement of congruence, consistency, and effectiveness of theories-in-use by preventing learning" (:86).

Argyris and Schön observed many persons over the course of several years, and most seemed to act according to model I. But when they interviewed the people, most of them described their activities in different ways, normally without the dysfunctionalities of the model. There was a large difference between their observed and espoused actions. (See page 45 in *Context* for accounts of the *espoused theory of action*.)

Argyris and Schön assumed "that there is great demand for a model of theories-in-use that reduces the negative consequences of model I and increases growth, learning and effectiveness" (:85). They named this *model II* and said that its "most significant property […] its ability not to be self-sealing, its tendency to permit progressively more effective testing of assumptions and progressively greater learning" (:86).

Argyris and Schön realised that the persons they observed and interviewed in their research all had *governing variables* that they tried to keep within certain limits. Governing variables seem to be a wide range of dimensions, including personal values. Keeping these governing variables leads to the different models of action mentioned above. For model I the governing variables are *define goals and try to achieve them, maximise winning and minimise losing, minimise generating or expressing negative feelings*, and *be rational*. For model II they are *valid information, free and informed choice* and *internal commitment*.

They assumed that since the governing variables of model II were the espoused, highly valued, ones, the model itself should also be accepted easily. They imagined that people in organisations who acted according to model II would learn a great deal and be very effective, and that their power relations would be bilateral rather than unilateral (:170).

Horizontal relations

Manuel Castells says that horizontal relations characterise the current 'Western' societies; that is, people have direct contact independent of their positions in organisations (lecture 2008-11-28 at KTH)[3]. Increasingly, people expect to be able to have direct contact and not communicate through hierarchies within organisations. Castells claims that this culture has grown out of coincidences like the immense growth of networked communication technology, especially email which facilitates person-to-person communication.

Mobile phone networks and connected devices also support non-hierarchical relations since individuals need not communicate through manual switchboards and secretaries.

The non-hierarchical approach is also a deliberate foundation in some organisations and companies. One of these is WL Gore, the company that has created Gore-Tex and other high-tech materials. From its start fifty years ago the company has had an almost completely flat culture where there are no managers or employees, only 8500 'associates' (Stern & Marsh 2008:10).

3 http://www.csc.kth.se/forskning/mdi/nepomuk/UAvideos/Manuel_Castells_081128.html

Direct participation and learning in the workshops

The participation in the workshops is personal and the participants are not seen as representatives of some group of people, but participate as themselves. I call this *direct participation*, paraphrasing Ben Schneiderman's concept of direct manipulation, in order to distinguish this kind of participation, which one does with one's own body together with other people, from representative participation, which is common in organisations, market research, etc. Direct participation supports horizontal relations with the other participants who are other stakeholders in the field in which the workshop is framed. Participants can be prospective end-users, developers, producers, service providers, policy makers, etc. The workshop provides an arena for all the stakeholders to participate together directly and on equal ground.

In reality the ground for each person cannot be completely equal since they are not equal outside of the workshop event. Some of the participants may control large industries that they can control. Nor can all the possible stakeholders be present at the same time. One reason is that the actual proposal is not articulated at the time they are recruited; therefore the proposal that is created might require other stakeholders in order to be produced. But still the aim to regard everyone as equally important is critical.

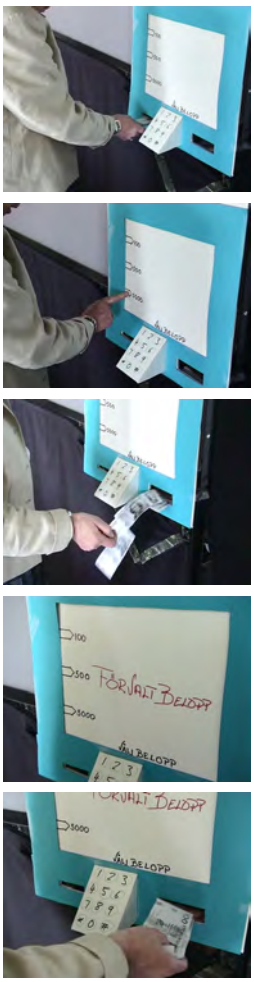
As the workshops begin, the participants tell about critical incidents they have experienced. The groups discuss them, and other participants contribute to the discussion with their own experiences and knowledge of the matters being discussed. This dialogue and other creative activities support mutual learning. Stewart (1995) says that it is only through dialogue that a person can come to an understanding of someone else. This emphasises the relational nature of the workshop.

During the discussions we should not think of the individuals' experiences as being represented in language; instead they are *constituted* through the dialogue. When the understanding of the present situation shifts to discussions about how to change and modify the world it is even more apparent that the dialogue regarding proposals for future artefacts cannot be representations of the artefacts since they do not exist. Representation assumes prior existence.

Argyris and Schön acknowledge that in order to support the participants in being open to uncertainty and possibilities for change, the conditions must support the governing variables of model II. During the workshops our objective is to create and sustain an open-minded attitude where trials and all kinds of proposals are welcomed but also

challenged in a constructive way. The approach we encourage is to test first, not to give an articulated account for all details first. That is, we do not begin with an *espoused theory of use*; instead we aim to explore in-the-making.

The following video prototype is one result of discussions of a critical incident, which led to a creative dialogue among the participants.



Video 2, Ingrid does not see the sum she has chosen, Ingrid has 500 as the preferred withdrawal sum on her card

One workshop focused on proposing automatic teller machines (ATMs), and other machines for payment, that would be accessible to persons with different disabilities. In this workshop, Ingrid, who is visually impaired, told us about a problematic incident she just had experienced. One day just before the workshop when she needed to withdraw cash from an ATM she could not use the one near her workplace. She normally uses this one since she is familiar with how it works. Instead she found another one but since the display was different she accidentally took out 5000 Swedish Crowns instead of the 500 she wanted to withdraw.

The other participants started to discuss this and other experiences with ATMs but also possible ways of changing them so that this event would not be repeated. One person suggested standardisation and claimed that if all the ATMs had exactly the same layout and sequencing this would never happen. Another participant argued that such standardisation would put a stop to all future improvements. A few more suggestions were made before one person suggested personalisation: somehow the ATM should be informed that now it was Ingrid who was in front of it. Ingrid said that she normally wants to withdraw 500 Crowns and if the machine 'knew' that, she would not get into trouble.

The group built an ATM mock-up and made several videos that showed both problematic and desirable activities. Near the end of the workshop, when the video with Ingrid's personalized ATM card was shown, one participant from another group said that he had been involved in the process of developing an ATM. During that work they had learned that there is a space on the card's magnetic strip that could be used for personalisation, but they had not figured out what to use it for.

This story shows some of the valuable aspects of having several people participating in the work and discussions. Without the input from the different stakeholders we would not have learned about the available standard on the card. We would also have thought that providing

sound in the ATMs would solve the problems that face persons with visual impairments as they use ATMs. We also come to understand how unsatisfactory the 'normal' design process is when we realize that if the development team had seriously involved a few end-users during the design work, today's ATMs would be far less problematic.

The story provides an excellent illustration of the workshop's procedure: Ingrid gives an account of a critical incident, various stakeholders participate in discussing possibilities and create a proposal for improving Ingrid's future interactions with ATMs, and then stakeholders contribute with relevant knowledge regarding how to realize the proposal. This is a *model II* process, a process of mutual learning, a design process.

This example also shows how important it is that the persons participating in the workshops are actual stakeholders; that they have personal experience and knowledge that they contribute within the workshop and thereby participate in creating the proposals. Even more important, the stakeholders share valid information in an open and non-defensive way in order for others to build on it.

Another example that illustrates the benefit of having several stakeholders working together on a proposal comes from a workshop on the accessibility of digital TV.

Video 3, Lego remote control, a tailorable device

As the video begins, a man walks into what seems to be a TV dealership. He shows the dealer three remote controls and says that he can't learn which one to use for which device. The dealer suggests a remote control that does not have any buttons in the beginning. It is possible to add the buttons and functions that the customer wants. The product that the dealer proposes is tailorable. It can be configured with the buttons/functions that the user desires. This configuration can also be changed over time.

The proposed solution is a combination of a physical product and a service, where the shop assistant tailors the product so that it affords only the relevant and desired interactions. This solution was created through the joint experience of 'end-users', shop assistants, engineers and manufacturers, all of whom were participating in the workshop.

On one other occasion, in a project aimed at creating a semantic desktop, we created a proposal for a computer application on our own. It was based on understanding we had created during extensive field studies and a scenario that had been created: *Claudia goes to Belfast*. The participants in the work with the proposal could perhaps be la-

belled designers, but the important issue was that none of us had deep technical knowledge. When we later showed the proposal to people with technical knowledge they said that the proposal was 'science fiction' and it would never work.

There are two lessons to learn from the 'science fiction' proposal. The obvious one is to include various stakeholders from the beginning in any work with proposals. The other issue is perhaps even more vital: how should a proposal be judged in the first place? It is clear that the person with technical knowledge regarded the proposal as a rigid one, as a collection of requirements. And since he noticed aspects that he did not regard as possible to solve technically, the proposal was not interesting to him.

But the proposal should be regarded neither as a list of requirements nor as a representation of the final solution. Instead it should be interpreted as one contribution to a discussion and as such in need of more contributions to help the discussion create relevant knowledge and proposals.

This was an example where we did not manage to handle the complexity of desires, possibilities and constraints, primarily since we did not have all the relevant stakeholders participating in the work.

Reducing complexity: Emphasis on touchpoints

It is important to support the participants in the workshops so that they do not get stuck in the complexity that is common when persons or technology is involved. The example above with Ingrid and the ATM (page 72, vp 2) is of course a simplified account and in reality the financial networked system is very complex. But the workshop bypasses most of that complexity by focussing on Ingrid's interactions. This is the *touchpoint*, in the vocabulary of service design, or the *interface* for those using a design concept (Krippendorff 2006:78).

Dealing only with the interaction has an advantage that it focuses on the particular activities where artefacts are important. At this stage it is critical that the participants do not attempt to generalise.

During the workshops the participants do not refer to the specific interactions using any concept or category; they merely propose specific ways of acting and then just act. It is fairly easy to explain this way of working in order to reduce complexity, and to support it during the workshop activities. This also supports the much-desired horizontal relations between the participants: when the focus is on user interaction they can all contribute.

The following video prototype is an example of dealing with quite complex issues.

Video 4, Buying bedclothes





In the autumn of 2008 two colleagues and I conducted three workshops on publicly using e-payment with participants who had various disabilities. The workshops included other participants like stakeholders from industry, politicians and civil servants from several European countries.

During the e-payment workshops one person with cognitive disabilities told us that he sometimes buys things that he does not need and sometimes cannot afford. The group created a proposal for a device that could both check that the price was reasonable and 'investigate' that the item about to be purchased was one that the person really needed.

The proposal included a networked device that provided information to the user via a wireless headset. When the user was about to purchase an item in a shop, the device received information regarding the item via the cash register that the shop assistant used. The user both saw the sum on a screen and heard it being read aloud in the headset. The interesting addition here was the service that discussed the user's consumption activity with him.

The scenario included the user purchasing bedclothes for 53 Euros. Here is a piece of conversation from the video prototype, the second version of three:

Customer (approaching the counter): — I'd like to buy these.
Shop assistant: — Very good choice. That will be 53 Euros.
Voice in the customer's headset: — 53,00 Euros. Brand name: Dux bedclothes. One item. Do you really need this? (Confirmation needed)
Customer: — There must be something wrong. It says 530 Euros.
Shop assistant: — No, 53 Euros.
Customer: — I'm sorry I both heard and saw wrong.
Voice in the customer's headset: — Price is within comparable limits. Price is confirmed. We did the compulsive behaviour check: No problem. No unusual shopping activity warning.
But, do you really need this? I see that you have "soap" on your shopping list. You are buying bedclothes.

Customer: — I'm sorry I forgot one thing. I was supposed to buy something else. I'm sorry and will put this back and buy what I was supposed to buy instead.
Shop assistant: — No problem, sir. Good-bye.

During the discussion that followed the presentation of this video prototype, one participant from another group questioned whether this was possible to achieve or was just a result of wishful thinking. One person in the group explained that they had considered the application carefully and had a way to achieve it with the technology and information available today. The price range could be checked through Pricerunner or similar services and the compulsive shopping behaviour would be both preconfigured and adjusted over time. The user had to enter his shopping list into the device manually.

Two other versions of this situation were also created. The three versions show three different people buying the bedclothes: the person above, along with a blind man and one other person. The origin of the story is that one participant in the group, who is blind, had recently bought bedclothes and the shop assistant had accidentally entered €530 instead of the correct €53; the buyer did not realise this until he paid his credit card bill much later on. The different versions of the video prototype were triggered by participants' different experiences and desires for solutions regarding this scenario. It was important to create a multiplicity of proposals in order to show how important it is that these large systems support personalisation and individual solutions.

This is another example of how the different stakeholders, persons with different relationships to the virtual future artefacts, collaborate and create something new. These proposals are radically new and seem to be very relevant to two of the users thanks to the contribution of the participants with their different kinds of knowledge and experience. It is reasonable to think that a product like this could also make a major contribution to other persons who have difficulties in similar contexts. As a result of the participants sharing their knowledge, the proposal includes not only the necessary interface but also ideas for the technical system or the back stage.

The proposals from these workshops clearly show that enough technology is available, but it is necessary to adopt an overarching approach and propose standards and protocols that would create a more accessible lifeworld for many more citizens. However, strong political and commercial interests are involved in the development of technology, along with standards and legislation; at best the workshops can

provoke and inspire these other elements but they cannot have a great impact on them. .

All video prototypes are useful

All video prototypes are useful, but some are more useful than others. Almost all video prototypes that the participants create contribute to a better understanding of some aspect of a given workshop topic. But not all video prototypes contribute broadly to the understanding of the design space that is being explored during the particular workshop. As described earlier, ideas that lie outside the design space can be equally valuable since they also help define the design space by showing what is outside, what is not a desired solution. They can also contribute to understanding the participants' contexts, preferences and capacities. These ideas can also very well be the seed for other more relevant proposals.

But sometimes the participants propose ideas that are way beyond the scope of the topic at hand, which does not facilitate understanding. We have examples of situations where participants actually created two similar proposals during two subsequent workshops and both were out of scope since they did not deal with the context that the workshop focused on exploring.

Sometimes individuals who regard themselves as representatives for a group of people can puncture the dialogue by proposing a ready-made suggestion. Or they can push particular issues at the expense of others. This may happen because they are not used to dialogue based on mutual respect where the objective is to create new proposals. They are used to pushing issues in verbal debates.

There are also situations where the activity stays in the model I mode. One example is a group that was very critical about the set-up and was certain that there was a secret agenda behind the workshop. They were not sincerely engaged in creating proposals for improving the working environment or anything else that could concern them. After a great deal of persuasion they did create three proposals, called *Chipped,* that were only remotely related to their own roles in the organisation and did not relate to their personal experience.

Video 5, Chipped

Includes:

Bag finder,

Wallet with sender, and

Chipped moose search.

This video prototype consists of three animations that have a similar theme. Something is lost and then found.

A bag is lost during a flight, and is found with the help of a mobile phone.

A wallet is opened and a 'chip' is put inside. An address is presented on a mobile phone display.

The story about the moose presents the moose, the king of the forest, and the Swedish king, the King of the People. The moose apparently gets killed and is found with the help of a mobile phone that tracks the bullet, in which a chip was embedded.

The video prototype ends with an advertisement for freezer bags.

The bag, the wallet and the bullet all contain a 'chip' that a mobile phone can locate.

The stories are animated with the help of clippings from magazines. It includes some descriptive texts that are intended to guide the viewer since the video is intended to be silent. But in the background one can hear the group discussing how to show the 'next picture' and on one occasion a woman says:

– He doesn't think that we are enthusiastic.

The woman's remark that she believes I do not think they are enthusiastic enough clearly shows some of the complicated dynamic relations during the workshop.

The participants in this group seemed to be occupied with understanding what goal I might have for the workshop; since I was working at the technical university in Stockholm (KTH) they may have created a video prototype that involved technology, but it was not related to their own situations. They tried to *identify a goal* and *achieve that,* which is a typical *model I theory-in-use* governing variable (1984:68). Argyris and Schön observed in general people tend to act normally and learn in ways that can be seen as *model I theory-in-use.*

Every person who arrives at a workshop comes with his or her own governing variables and everyday preoccupations. Most people are not used to participating in workshops, and show some degree of resistance when they understand that they must abandon their entering mindset and act in ways that involve double-loop learning, actions that can be described as *model II theory-in-use.* As Rostvall and

Selander (2008) said, learning often involves giving up something for something else and this can be painful. I should not exaggerate this loss, as the workshop is hardly a major event in the participants' lives; still, challenging the opinions that are taken-for-granted does have impact on ones' confidence. It is easy to understand that some people hesitate to relax and let go during the workshops when this is not what they normally experience in their everyday lives.

It is important to acknowledge that it is the responsibility of the conductor/designer to create and sustain a setting that supports the participants in achieving and maintaining an approach that can be seen as model II theory-in-use. I account for and discuss this idea in the next chapter, *Attention*.

Participation and democracy

The workshops result in understandings of fundamental changes that are needed to make life better in some sense for some person in some context. Having conducted several workshops with participants who have various disabilities, it has become obvious that problems with accessibility concern many of the everyday technologies that surround us. It is equally obvious that if all the relevant stakeholders had participated in the design of these artefacts, the problems would not exist to the same extent that they do today. These are of course issues of democracy and power and one underlying aim of the workshops is democracy: to give influence to the prospective users of the artefacts and to create proposals that are meaningful for them.

There is of course no single 'best' solution, which is very obvious when working with e-inclusion issues. Instead there seems to be a need for open systems that make it possible to tailor and personalise the solutions. This became evident in discussing and reflecting on the wide range of proposals created by end-users and other stakeholders.

I have touched on how participation starts but the question of when participation ends is still open. In the workshops discussed here, that are not part of research projects, the participants take part in only one or two workshops. Since the participants jointly create knowledge it would be an advantage to have their participation throughout the whole process. The participants create an attention to difference that can contribute greatly to more of the design work. Ideally the participation and design work should continue even when the product is in use. Normally complex products often involve a need for updates and re-design. Therefore the idea of *continuous participation* by all relevant stakeholders should be explored.

Aspects of the participants' activities

When the shared attitude of the participants is open to learning and behaving according to model II, the tendency is for participants "to help others, have more open discussions, exhibit reciprocity, and feel free to explore different views and express risky ideas" (Argyris & Schön 1974:91). They leverage from the valid information grounded in the participants' actual embodied experiences into a free and creative discussion about desirable alternatives.

The dialogue should primarily be seen as constituting the workshop where the participants co-operatively create ideas for proposals. One benefit of the playful attitude and creative process is that they take advantage of the dilemmas and complexity that multiple stakeholders bring, rather than having the dilemmas and complexity function as obstacles.

Designers can contribute substantially when participating in these activities since they almost always are engaged in learning and often in co-operative learning. They typically work with public testing, double-loop learning and have an aim-oriented approach instead of a goal-driven one. This gives designers experience that can be seen as model II activities.

Attention: The designers' responsibility

This chapter deals with the activities designers engage in while conducting the workshop, and how those activities support the participants' creative work. Theories regarding frames are introduced, and these are used together with examples in order to learn more about the workshops.

Frames guide our understanding

People live in complex and complicated surroundings where many continuous changes and reconfigurations are occurring. These are usually not very troublesome for us to handle and we normally feel that we have enough control. For example when I ask for a cup of espresso at a café I understand what is taking place and reach for my wallet and hand over some money or swipe my bankcard in exchange for the coffee. One way of describing these actions is that we understand them in terms of *frames* (Lakoff 2008). Frames are small narratives with simple structures that are among the cognitive structures we use to think. Having bought my coffee, I have taken part in a consumption frame which pulls all the separate actions into a meaningful whole.

Lakoff describes how such a frame works: words "like 'cost,' 'sell,' 'goods,' 'price,' 'buy,' and so on are defined with respect to a single frame." Roles are also important here:

"The roles are Buyer, Seller, Goods, and Money, and the scenario is simple: first the Buyer has the Money and wants the Goods, and seller has the Goods and wants the Money; then they exchange Goods for Money; then the Buyer has the Goods and the Seller has the Money." (:22)

This frame is also the basis for reasoning about commercial events.

Frames guide people's behaviour and their understanding of the situations and activities they encounter, and the process is usually unconscious. In the example above I am not conscious of the consumption frame itself that guides my actions. Instead I act reflexively (:249). This is also a quality of the frame since it guides persons to act in an

appropriate ways. Individuals are liberated from taking notice of and having to actively interpret all the details they encounter. A frame provides the rules and principles that guide our understanding of activities we have experienced. Of course this is only true if an appropriate frame is evoked. If a frame that is not relevant is evoked it will lead to *breakdowns* or misunderstandings.

Even actions, like grasping an object, have frame structures. The same applies here: if a frame is evoked and the object does not *afford* the intended interaction, there will be a *breakdown*. This makes it obvious that designers must understand peoples' frames, although this is not the primary focus in this part of the thesis.

People have many frames and often use multiple overlapping ones. If I buy a ticket on a bus, I am involved in a commercial frame and a transportation frame at the same time. If one frame is evoked it is often strong enough to exclude a person's other frames that would suggest alternative meanings (Lakoff 2008:225).

Keying and cues

Keying can influence the framing activity. Erving Goffman defines a key as "a set of conventions by which" the participants see "a given activity ... to be something quite" different (Goffman 1974:43). The transformation is established partly with the help of *cues*. Examples of such cues are winks or smiles that might be used to show that something was intended as irony. Cues are actions, talk or artefacts that indicate that the activity should be interpreted differently than the way one would frame it without keying. Cues provide a bracket in time, indicating when the transformation is to start and end. It is also important that all participants in the activity know the intended meaning of the keying "that will radically reconstitute" what is going on for them (:45).

Goffman says that the activities that people frame only in terms of a primary framework are real or actual (:47); that is, they involve no keying. Keying is a useful way to describe and understand theatre, sports, games, ceremonies, etc. We do not think of the activities on a stage as real, but we do regard the staging of those actions as really occurring.

Attention

It is difficult both to describe and to learn the *attention* that designers need to practice. Although it is hardly new in this context since Schön and others have touched on its importance, it is still difficult to articulate verbally. Bengt Molander quotes Ulf Linde, a famous Swed-

ish art critic, who describes "knowledge or skill as a form of attention" (Molander 1996:11, my translation) and says further, "you cannot create masterpieces through education but you can learn attention as a routine". This indicates the nature of some of the knowing or skill necessary for artistic work. It is also interesting that Linde/Molander chose not to distinguish whether this attention is knowledge or a skill.

This attention can be seen as awareness or described as an attitude. Attention is very much related to the *reflection-in-action* that Donald Schön describes (1983). Reflection-in-action is very much an intuitive, embodied knowing that is enacted during professional work. The concepts of intuition and reflection-in-action have connotations as somewhat unconscious and passive. This is why I suggest the use of 'attention', which I regard as a more active way of reflecting-in-action.

Judi Marshall and Peter Reason suggest several qualities that enable the researcher to take an *attitude of inquiry*; among them are "curiosity, willingness to articulate and explore purposes, humility, participation" (Marshall & Reason 2007:3).

In the book *Co-operative inquiry* John Heron outlines several skills relevant for conducting co-operative inquiries where action is in focus; they include "being present, imaginal openness, bracketing of several kinds and reframing" (1996:118). Heron also suggests the need for "a radical kind of participative awareness" (:128).

These descriptions provide some idea of the qualities that we need in order to pay attention, but they also show how hard it is to verbalise the skill or knowing of how to pay attention. The descriptions give hints about what to focus on; below I describe the critical role of paying attention during the workshops, mainly for the designer/conductor but also for the other participants.

Frames and attention in the context of workshops

The individual participants come to the workshops with experience, values, opinions, relations and frames that influence their interpretation of the situation and its objectives. All this has an impact on how involved they want to be. It is important to attend to the initial and ongoing keying of the workshops in order to maintain a framing that supports creativity and the notion of play.

Keying the actual activities involves getting all the participants to interpret (see) the situation as creative, playful and friendly, according to their own individual frames. Clearly, keying needs to be done on several levels, from an overarching perspective to an emphasis on the details of the work.

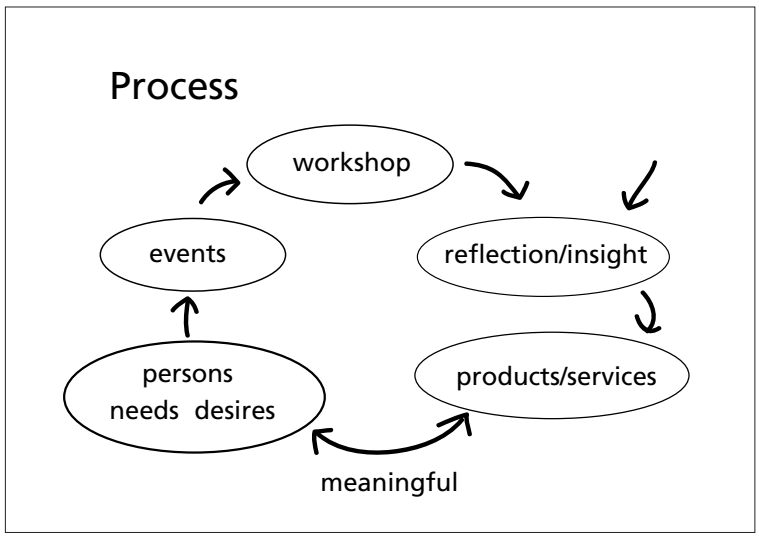
Initially establishing the discussion

The initial establishing of a workshop has two main aims. The first and most important is to key the workshop itself into a creative event that is limited in time and where a serious and playful approach is expected. The second aim is to constrain the topics discussed to support that ideas will be created within the desired field.

The premise is that all people can evoke creative frames, frames that tell us that 'we can'. As the workshop begins, it is important that all the participants get the feeling that the group really can create new and relevant proposals. Therefore it is crucial that the initial keying done by those running the workshop evokes the participants' 'creative' frames instead of their 'destructive' ones. We do this deliberately in several ways.

During the introduction we make the overall structure of the workshop explicitly clear to the participants by carefully explaining the objectives of different phases. We also explain the workshops' relationship to events before and after it. We demonstrate the process explicitly, with a few 'steps' and with a linear structure. The idea is to key the workshop as a creative and relaxed event that cannot go wrong. The participants should feel that nothing will be seen as a mistake but will instead be appreciated for its contribution and creativity. Those of us in charge of the event say that we have done similar workshops

Figure 6. Picture of the "context and overall process" shown to the participants during the beginning of the workshop indicating what has happened before the workshop and what can happen after.



many times before, there is no secret agenda, it is a 'safe' place, etc. It is an event in brackets.

Often we post a schedule on the wall, to support some people's need for a definite structure. This normally takes care of the uncertainty about the process itself, which is important to address: people who feel uncertain tend to frame a situation as not interesting to participate in.

The duration of the workshop is constrained and specified; this seems to help isolate the event and support the adoption of creative and playful frames. Since the time is often relatively limited, the tempo has to be fairly quick, which also helps to keep unwanted aspects of the 'outside' from entering the room. There are no individual breaks. We discourage phone calls and computer use, which would take people 'out' of the common context, the workshop frame.

Normally, the actual topic does not require much explaining. Usually the participants are already aware of the overall topic and some explicit constraints help to clarify it.

Keying the actual activities is a sensitive business and the conductors need to pay attention since it is easy for people to slip out of their creative frames.

Hierarchical frames tend to make people either restricted or restrictive. In various examples from the workshops one person acts as if his opinions, knowledge and experience are superior to those of the others. Then the 'other' persons tend to become quiet and inactive. The person running the group must interrupt this frame in some way and instead initiate a situation where horizontal relations can be created and sustained between all the participants as well as with the organisers. Most often this can be done in such a way that the dominant person does not lose face. A good alternative is to explain to the person that their reflections are very good, but that they should be shared with all the participants during the discussions in the plenum at the end instead, since they are on a more general level. In fact this is usually the case so it is not a total lie. Such interventions ensure that the very critical discussions will take place towards the end of the workshop, facilitating an open discussion of the proposal's pros and cons.

Although the designer/conductor has an advantage over the other participants for several reasons it is not in his or her interest to be dominant or influence the work to a great extent. On the contrary, the aim is to create and sustain co-operative inquiry, learning and creation among all participants. The designer/conductor must pay attention

and make use of his or her advantage when the process is not working so well.

During a workshop, many other undesirable frames can emerge in addition to the "being important" one mentioned above. The opposite can also be problematic: some people will claim that they are "not creative" or "incompetent". Others will try their best to "please the authority" i.e. the conductor; this may not seem that problematic, but their work will be of little use since they will not create scenarios that are grounded in their own life. They will try to guess what is expected, or try to figure out a secret agenda. This is most likely a good explanation for what happened between the 'third group' and the conductor at the workshop discussed on page 78, (vp 5).

There are also examples of participants who produce products or supply services and who lead to breakdowns. They tend to frame themselves rather defensively at the beginning of a workshop since they are prepared to defend their current business. One example, from the workshop focused on proposing ATMs, is the man from a large bank who was rather stiff and defensive initially; after half an hour, however, he had taken off his coat and tie and participated eagerly in one of the video prototypes as a car, honking wildly at the slow disabled driver in front of him. He was being very present in the actual workshop activity and enjoying it. He had realised that this workshop was not about complaining about the current situations but rather about proposing desirable futures. This happened partly because the conductor-designer explicitly focussed the discussion towards opportunities.

One of the key responsibilities of a workshop conductor is to pay attention to the character of the dialogue and other activities and use cues like those described above to maintain creative, constructive and inclusive ways of being.

Keying with physical artefacts

So far I have mostly reflected on verbal cueing. A physical way to use keying is to work with the placement of the furniture in the room and the artefacts at hand. Normally the group sits around a table that has coloured paper, pencils, scissors, tape, candy and other materials on it. There is always another table full of more material, tools, magazines and sometimes toys and other things. These are cues that are intended to reconstitute the activity from a meeting into an engaging and creative workshop.

Emphasising the particular

For several reasons we want to frame the work into dealing with particular activities. One way to achieve this is to ask the 'end users' for their recent experiences regarding the activities in the workshop at hand. The storytelling should be as precise and concrete as possible in order to support the creation of articulated proposals for solutions. Asking people to talk about specific events also keeps them from talking in a general and abstract way. Simply being in the realm of language encourages more abstract talk; the danger in this is that participants can reframe the workshop into a 'competitive discussion frame' in which they will act in order to maximise their winnings, and this will not benefit the creative work at this stage.

Here we loosely use the *critical incident technique* (Flanagan 1954) to help the participants identify and explain situations that they themselves regard as important and often troublesome in some sense. We ask them to recall *real and recent experiences*, which they tell in their own words focussing on the activities and what they mean to them personally in that particular situation and context. These stories are *narratives* or *scenarios* and include persons, goals, settings, actions and events as well as the sequence and often a breakdown of some kind.

Since these stories are the foundation for the work during the workshops the designer must pay close attention to them. My experience is that they need to be grounded in real experiences, and involve activities that can be acted out and aspects that are not easy to verbalise.

Examples of cueing, keying and framing in practice

During one of the workshops with the deaf sign speakers on the topic mobile video communication, I heard Ragnar tell his story about how he had considered putting up notices in his neighbourhood with his telephone number, in order to sell his sofa. But since he is deaf it would not be such a good idea. I understood right away that this was a very good starting point for a video prototype. Since Ragnar is deaf, he and a hearing and speaking person would not be able to communicate with each other over a telephone. The story involved communication, activity and interaction and therefore had several details that the group could visualise. The aim was very clear: to sell the sofa. The story also included settings, activities and persons, which fulfils the requirements for a scenario (Carroll 2000). This is an authentic story.

– How can Ragnar sell his sofa? The conductor asked this of the participants. The group responded with several ideas for solutions. Someone suggested:

– We can connect the two people with a sign interpreter through the mobile video telephones.

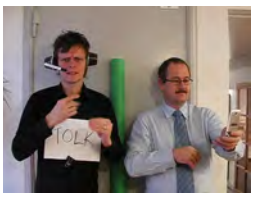
I then said:

– OK, great. Let's shoot this. Who will phone Ragnar and buy the sofa?

And a participant responded:

– You can do it. ...

One can see the importance of the initial question that I asked as workshop conductor. It worked as a *cue* to develop the idea further and eventually create a video prototype.



Video 6, Ragnar sells a sofa
The video shows a person (me) dialling a number written on a note saying "Sofa for sale". The call is connected to Ragnar via an interpreter. The buyer asks about the sofa using his voice, and the interpreter signs his words to the seller who is deaf. The seller then signs answers that the interpreter speaks to the buyer. The seller also shows the buyer what the sofa looks like, via the video function.

The participants were using creative frames when they developed the video prototype *Ragnar sells a sofa*. The staging using a split screen is a creative solution that they designed co-operatively. At the end of the recording someone came up with the idea that Ragnar could also use the video capability to show the sofa. This was not initially in the scenario but the opportunity was actualised in the video prototype.

This is an example where the participants themselves paid attention and seized the opportunities that were created.

In the following example the designers/conductors had to pay close attention and take some decisions.

During a series of workshops where the participants were adults with cognitive disabilities, for example ADHD (Attention-Deficit/Hyperactivity Disorder), the critical incident technique rescued the situation. We did not use the name of the technique during the workshops; instead we used the expression *real and recent*, which worked very well to help the participants tell us stories about events they consider meaningful.

The atmosphere was rather relaxed and it was extremely difficult to keep the discussion on one or even a few tracks. Whatever one per-

son said triggered the other participants in different directions. But once we had heard some stories of difficult situations we rose from the table and discussed the best way to show them. We wanted the participants to decide on at least one incident that they wanted to develop into a video prototype.

One woman told us one of her critical incidents: she had forgotten to take her laundry out of the washing machine. She said that she actually needed some kind of nagging device, something that not only reminded her of things she had to do but also kept on reminding her until she actually did them. When she had lived with her parents they kept nagging her until she did the necessary things but now that she was living on her own she left many things undone.

Another participant said that he uses the alarm function on his mobile phone in situations like that so he will be reminded when the time comes. He has a rather advanced mobile phone and can assign different colours to the reminders, which helps him to remember. Someone proposed that the washing machine itself could 'tell' her when it was ready. Everybody agreed that this seemed to be a perfect solution.

But the group wanted to go on and talk about other incidents and issues so we had to be very active to get them to focus on and create the video prototype of the *Nagging device*.

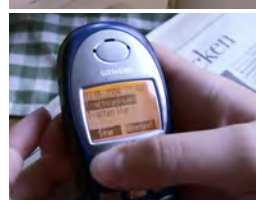
Video 7, Nagging device: A washing machine that sends an SMS when it is finished

The following is shown in the video prototype that was created:

A woman puts laundry into a washing machine, starts it and goes away. She waters her plants and while she is doing that she gets an SMS. She ignores it but after a while the device reminds her again.

She goes to the machine and takes the laundry out.

The video on the DVD is a remake since the woman on the original video prototype does not want her identity to be connected to the diagnosis of ADHD.



This is an excellent proposal and it was very easy for those of us participating in the workshop to understand that if this interface were available it would be of great value for her. It is also obvious that many people would use a product that afforded this if it were available. This is a good example of a *Design for all* approach.

On the other hand, this idea seems almost impossible for an individual to build. But if the Internet-of-things develops as predicted,

before long household appliances will all be connected to the Internet and then people probably can have interfaces like this.

The two previous examples concerned everyday personal situations.

The next example involves professional work. It is from a series of workshops that involved workplaces on three islands in the Stockholm archipelago. The islands are so far from each other, about 100 kilometres, that the employees very seldom got the opportunity to meet. Basically these three workplaces were to be seen as one in the sense that the work was shared among all the employees. The workplace was a call centre for the Stockholm County Police. Their major work was taking phone calls from people who reported crimes after the fact.

The overall aim of this project, called the K Project (Lenman et al. 2002, Räsänen 2007), was to promote a sense among the employees that they belonged to the same workplace. Several different methods were used during the initial studies and the design work, including observations, interviews, probes, and different approaches to prototyping; here I will focus on two sets of workshops that involved the participants in creating short video prototypes.

The first workshops were conducted in situ on the three islands, and involved all the employees who were available at that time. The workshops took place at their job site, both directly in the working environment and in the kitchen. These workshops had a brainstorming approach, with an open and exploratory nature. After some weeks we gathered all the participants from the first workshops in our lab in town for a bigger joint workshop that was more oriented towards a prototyping approach. Employees from all three islands participated in this workshop.

The workshops had two basic aims. One was to create ideas that would be meaningful when implementing the system to be created. The other was to construct knowledge regarding the participants' specific situations, activities and values. The latter would also provide important perspectives and insights for the design work and the 'final system' but not in as direct a way as the ideas. The emphases within these two aims were different between the first series of workshops and the final joint workshop. During the first ones the explicit emphasis was on the context as a whole; during the joint workshop it was tightly framed to the work contexts and activities.

During the first round of workshops the participants were told that they could consider whatever they thought was of value for them in one way or another. There were several reasons for this; most im-

portantly, we needed to gain some knowledge about their lives on the islands. What do they value, and how do these values relate to their workplace? Our overall objective was to improve their work conditions but that would only be possible if we had enough understanding of their context as a whole. In addition to this understanding we naturally were interested in concrete design ideas but that was to be the aim for the second joint workshop.

The explicit assignment that I gave at the start of the workshop was for the participants to share issues that they regarded as meaningful. They could involve their work, the life on the islands or any other matter of importance. I had deliberately made this vague since we wanted to learn a lot about the life on the islands and be surprised. See figure 7.

Video 8, Happy company, without disturbance

In one group three women worked intensely: they cut holes in boxes, attached wires and flags to them and also cut out a bar code and taped it to one of their foreheads. Now and then they videotaped their actions. Later that day when all the workshop participants looked at the video prototypes that the three women had created they were all impressed. The three women had created three great proposals for improving their work and at the same time given illustrative accounts of the current conditions in their workplace.

One of their videos is titled *Glatt umgänge, utan störning* (*Happy company, without disturbance*); it begins by illustrating how difficult it is to work when colleagues are talking nearby. After this account of the current situation the group shows their suggestion for a way to interact with each other in the future without disturbing their colleagues.

Two women are working in the call centre, and each has a Ljudmössa (Sound Cap) beside her. One of them changes the positions of the two flags that are attached to it. She raises the green one and lowers the red one. After a while the other woman does the same thing to her cap.

This is an indication that they both want to chat. Both women put on their caps and walk away to a working table in the same room. They laugh at something in a newspaper. They can have a conversation with each other without disturbing the other colleagues who are working in the same room.

After a while they go back to their working tables and take off their caps.

This is one of the ideas for improving the working environment that also shows many of the constraints of the present situation. It is obvious that they all need silence when they are talking on the phone, but also want to be able to talk, both while they are performing other duties and also for relaxation and all the other reasons we have for talking with our workmates.

Due to the creative frame and the group members' focus on the critical incidents, along with their embodied knowing of their work situation, they seem to have been able to attend to and show many relevant social aspects of their workplace.

The basic affordance that the sound caps should support is that they move sound between two or more of the caps that belong to people who want to talk at a given moment. This is clearly shown although the group has not prescribed any specific technology. This solution reduces complexity and meanwhile increases the focus on the desired use.

They also have indicated the quality that this interaction should have. It should be possible to interact without having to attend anything distracting in the setting, other than the availability flag. In this case the women can put all their attention on each other and almost need not deal with the sound caps at all since it is obvious that they do not want to log in or configure them. In Heidegger's terms the sound caps should be ready-at-hand.

The video prototype shows relevant and problematic experiences of the work. It also shows what a meaningful solution should feel like. The prototype does not represent a proposed solution. Instead it seems to show that in order to perform the work in a desirable way some technology could be used. The technology is not experienced as an object with properties but as an object people use *in-order-to-have-a-happy-company*, in the Heideggerian sense.

I regard this example as a beautiful instance of video prototyping at its best. The exact design shown in the video is probably not an acceptable solution, i.e. it should not be seen as a representation of the final system. But it should be interpreted as an articulated proposal of the affordance that the system should support. The actual boxes that the participants put on their head should be seen as an approach, a first attempt to 'discuss' the idea. When interpreting the results it is important to distinguish between the aspects that are judged to be loose and those that seem relevant and precise.

The participants in the group that created these prototypes seemed to be in a very creative frame, and did not feel as if anything they did could be 'wrong' or be misinterpreted. The stories that were the foun-

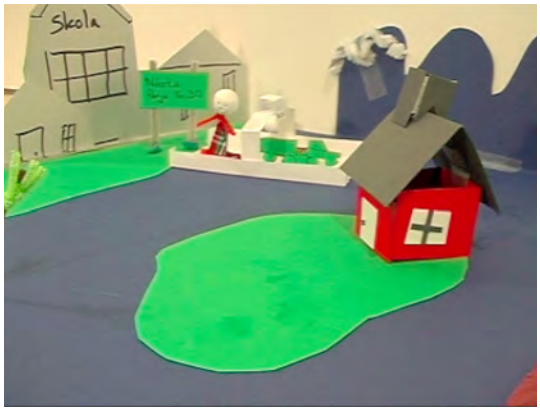


Figure 7. From a video prototype showing problems that can occur when people have to depend on a ferry. The child got sick at school, but the next ferry will not depart until 16:30, so he cannot get home and rest.

dations for the scenarios and proposals were highly related to their own embodied experience.

During the same workshop where the *Happy company* proposals were created, two other groups were also working. The second group created several video prototypes that illustrated some of the qualities and constraints of life on an island. The screenshot, figure 7, is from one of these. The third group was the group that created the video prototype *Chipped* (page 78, vp 5). They definitely did not act as if they were in a creative frame where everything was possible. Instead it seems that they wanted to 'please the authority', i.e. the conductor, which they did somewhat.

We can see quite substantial differences between the two groups' video prototypes. This may have been caused by the different frames that the groups were in. But it is important here to understand that as the designer/conductor at this workshop, I was not experienced enough to realise this. I was happy that the 'third' group finally created some video prototypes.

Looking back at this specific workshop it is clear that at first I had not sufficiently keyed the participants in order to help *all* the persons in the groups create results that would be beneficial to them. Of course it is not up to me to decide what they regard as meaningful and relevant. But I should be able to provide conditions where they can create proposals that they would like to see and thereby contribute to the discussion. The third group obviously had concerns since they reacted so strongly and it would have been very valuable to get accounts for that and also proposals for improvements and changes that they would want to experience.

During the workshops with the deaf sign speakers on the topic mobile video communication we learned that deaf people do not become aware of audio alarms, like fire alarms. This is a very serious problem. But although this is a very important issue, none of the participants had experienced this. Still, we decided to create a video prototype that showed a proposal for a solution to this problem. I was pushing this idea since I thought that it was a very critical aspect, and that it should be shown. The *Gas alarm* video prototype was created.

Video 9, Gas alarm
A woman is walking down a street when she feels her phone vibrating. When she looks at the display on her phone, she sees a person signing a message that she should go indoors immediately since there is a gas leak.

This video prototype does not show more than a verbal account of the situation would provide. But I did not realise at that time that it would not make such a relevant video prototype.

These examples show that it is not enough to rely on the method's structure and on intuition during workshops. The conductor must actively pay attention in order to support people in making more relevant proposals.

Paying attention: To frames, narratives, co-operation, governing variables

Attention can be seen as the overarching activity the conductor must engage in if the workshops are to succeed. Throughout the three chapters in this part on *Aspects* several critical aspects and situations are described. It is clear that the conductor of the workshop can influence their results by intervening in one way or another. But in order to know when and how to exert this influence, the conductor must know what is going on. And one tool for this is attention, which will turn out to be very important. By paying attention to the critical aspects it is possible to increase the number of good contributions. This may sound self evident and trivial but my point is that in order to actually accomplish this the conductor needs more than the propositional knowledge; also necessary is the knowledge to both understand the situations and to act on them.

Paying attention to stories

I have discussed the importance of the narrations that ground the scenarios and video prototypes. Reflection on the two previous stories

and video prototypes above reveals that activity-heavy stories are better foundations for video prototypes than more literal ones. There can be several reasons for this.

In the *Gas Alarm* video prototype (vp 9) above there was no actual personal experience, which made the scenario less detailed. The group did not see any conflicting issues with the idea and according to Heron (1996), less activity results in less joint learning. This also means that since there is less connection to the participants' embodied experience, they only give accounts for their propositional knowledge, i.e. intellectual statements that are systematically organised. These are easy to verbally account for.

The video prototype *Ragnar sells a sofa* (page 88, vp 6) grew out of a participant's actual desire. It also shows several aspects of communication that are difficult to describe verbally; that is, we needed Ragnar's embodied knowing in order to create and enact the video prototype with the help of the props. The video illustrates many details in the participants' activities and does not rely on verbal descriptions.

Some details in the proposal, like the experience that a telephone number is better communicated in writing than through sign language, came forward without any discussion, from embodied knowing. The intention is not that the interpreter-in-the-phone should make a handwritten note of the number (as in the video), but that the back stage system should take care of this.

Another example where the story was very important is the *Nagging device, a washing machine that sends an SMS* (page 89, vp 7).

A lesson from these examples is that it is critical for the conductor of the workshop to pay close attention to the stories told in order to support the participants with their choice of stories that give accounts of their embodied knowing.

Paying attention: Supporting multiplicity

Since multiple ideas often are generated, our experience is that it is most fruitful not to negotiate these into a single idea. Instead we encourage this multiplicity, creating several proposals since this provides a better understanding of the design space. Examples of this are: *Buying bedclothes* (page 75, vp 4), *Happy company* (page 91, vp 8), *Relieving Pressure* (page 111 ff, vp 13), and *Ragnar sells a sofa* (page 83, vp 6) along with *In the shop* and *Integrated headset* (page 104, vp 10, vp 11).

The lesson here is that, if we encourage several proposals on similar issues, instead of supporting consensus, the issue becomes more

richly illustrated and several desired futures are available for the further work.

Paying attention to frames for cooperation

The conductor must pay attention and constantly key the workshops in order to establish and support a feeling that facilitates co-operative creativity and the notion of play. At any moment something can happen that can lead a participant to evoke a less creative frame, and this can spread to other participants. the conductor has to deal with this quickly, which calls for attention to both notice and act; it also requires the conductor's embodied knowing about how to handle the situation for the benefit of all participants. One example where this worked well is the example of the bank employee on page 86.

One lesson here is to be prepared to engage directly with a participant in order to understand what he or she needs to feel secure, invited, necessary, etc. and thus want to contribute to the co-operative work, and act in ways that achieve this.

Paying attention and taking participants seriously

The 'users' are often very pleased with the relevance of their results. We believe this happens partly because they see the results as meaningful and partly because each workshop consists of a whole 'cycle' and the work results in tangible props and video prototypes that illustrate the proposals.

We also believe that the participants feel they have been taken seriously and that their contributions are important. Since this is one of the most important foundations for the reality-based video prototyping workshop method, it is critical that the participants are engaged and contribute with their knowledge. An example where this did not work so well is the third group at one of the workshops in the K project (page 86).

A lesson from this is to pay attention at all times so that all participants realise how important they are to the entire workshop. Then they can contribute with their embodied knowing and find the proposals relevant for their daily life.

Paying attention to the overall design of the workshop

The overall design and keying of the workshop, along with the decision about which stakeholders to invite, creates the foundation for the work. Lessons include inviting participants who have embodied experiences relevant to the proposed workshop topic and also to invite stakeholders who have the capacity to actualise the proposals after the workshop.

Aspects of the designer/conductors' activities

In this chapter I have shown that in order to support the understanding of the design space by generating several proposals and video prototypes it is critically important for the designer/conductor to pay *attention* to and support the participants' framing and provide cues that support keying them in creative, seriously playful and open frames.

The designer also needs to pay attention to the narratives of the participants and ensure that they are grounded in their embodied experience. Narratives that rely on action and include aspects that are not easy to verbalise should be encouraged since it is difficult to create knowledge regarding these aspects with other methods. It is also critical to continuously pay attention so that the participants are cooperating in ways that support mutual learning.

Designers are typically good at identifying narratives and ideas that have a potential to be successfully explored. They are clear about the aims, and pay attention to the whole and the parts at all times. Designers are often constructive with groups and can either provoke the group into a meaningful activity or seed the group by slightly putting one of the groups' own ideas forward.

Actualising proposals using props and prototypes

In this chapter I discuss the nature of the work done during the workshops and how the participants create and make use of artefacts. I introduce theories relating to different processes, and use them together with other concepts and theories to learn more about the theory and experience of the workshops.

Humans are often engaged in creating artefacts and changes; therefore they are called Homo Faber, the making human. These artefacts are not only physical but are also systems and routines; thus they also include the use of artefacts. The artefacts often involve other people both when they are created and when they are used.

In this chapter I discuss individuals' creation of artefacts with an emphasis on physical ones. In what way are these *new* in the sense that they can be regarded as different from previously existing artefacts, and how do people go about envisioning them before they exist? This is of course the very core of design work and a set of highly complex issues.

Process of actualisation

In her essay *Thinking the New: Of Futures Yet Unthought,* Elisabeth Grosz elaborates on concepts and theories in order to understand "the complex processes of becoming that engender and constitute both life and matter" (1999:16). Borrowing concepts from Gilles Deleuze (1994), she focuses on the difference between what he sees as a *process of realisation* and a *process of actualisation*.

Grosz and Deleuze make a distinction between the *actual* and the *virtual;* "objects, space and the world of inert matter exist entirely in the domain of the actual. They contain no virtuality" (Grosz 1999:25). Duration, memory and consciousness belong to the side of the virtual. Pure difference is something that is constructed, and should therefore be seen as virtual. Difference is not physical but still *real* in Deleuze's conception.

A process of realisation involves the realisation of a previously existing plan. Conceptually the possible becomes the real and the "real exists in a relation of resemblance to the possible ... Realization also involves the process of limitation, the narrowing down of possibilities, so that some are rejected and others are made real" (Grosz 1999:25). "Making the possible real is simply giving it existence without adding to or modifying its conception" (:26).

Furthermore, she writes, "The process of actualization is one of genuine creativity and innovation ... The lines of actualization of virtuality are divergent, creating multiplicities, the varieties that constitute creative evolution" (:27). And, "the virtual is the real of genuine production, innovation, and creativity. It is only actualization that engenders the new" (:27).

Her objective is to understand "the processes and creation in terms of openness to the new instead of preformism of the expected." Moreover, she says, "our very concept of objects, matter, being ... needs to be open to the differentiations that constitute and continually transform" life (:28).

Given my way of reading them, these concepts seem extremely relevant to use in relation to design work. Creative design work clearly should be seen as processes of actualisation.

Actualising proposals by creating the props and video prototypes

Here I make use of the distinction between processes of realisation and processes of actualisation in order to discuss the activities that take place during the workshops. I see a *process of realisation* as occurring when someone merely realises an idea without thinking about taking advantage of any opportunities during the process. In this situation the person is not exploring the *design space* but instead is mechanically realising their initial interpretation. On the other hand, in a *process of actualisation*, the participants pay attention continuously during the process and explore the opportunities that are created. The *design space* is kept open for exploration by elaborating on multiplicities of ideas. This process supports a better understanding of the design space.

As the workshops begin, people narrate several critical incidents. When the participants hear someone else's story they relate to their own lived experience and feed this knowledge back into the discussion of the incident. Often, several people have similar and related experiences, so the incidents can be described from several perspectives and aspects. The participants make connections between these experi-

ences and the critical incidents in order to create a multiplicity of ideas for improving the users' experience of the situation. The discussions are at the same time both focussed and open. They are focussed on the particular incident but also open for other related incidents and techniques that can be sources of ideas for differences. Following Deleuze these ideas are real and belong to the virtual (1994).

The multiple ideas constitute aims, directions for further investigation, rather than a final destination. The ideas are genuinely new, in the sense that none of the participants has brought these particular ideas to the workshop. Instead they are created from the different experiences and desires that the group has together. "It is through its reality that existence is produced. Instead of an impoverished real (the possible), the virtual can be considered more a superabundant real that induces actualization" (Grosz 1999:26).

Perhaps the most critical part of the workshops occurs when some of these ideas are chosen and are used as a foundation for the work with the video prototypes. During this work, as the participants create the scenarios and props, they actually relate to their embodied experience. They experience the difference in interaction between the various ideas. As a result, they make adjustments and changes as they work with the proposals. In the best moments this is a truly creative engagement: both the future and the critical incidents and experience are virtually present to the participants and are interwoven into the actualisation activities that create the proposal. The participants show that "the virtual is the real of genuine production, innovation, and creativity. It is only actualization that engenders the new" (Grosz 1999:27).

For example, in the work with the video prototype *Buying Bedclothes* (page 75, vp 4) the participants engaged in a discussion that produced several ideas for solutions that would work well for different users. By keeping the multiplicity of ideas and users in focus but still working towards a single overall solution for the shop assistant (and the back stage) the group came up with a three-part video prototype. It shows a solution with a Bluetooth head set for the blind user, the compulsory shopping guide for the person with cognitive disabilities, and a solution similar to the current use; thus it showed three different interfaces for the service. These can also be regarded as touchpoints. This approach to treating complexity – not narrowing down to one solution but instead creating several solutions – yields a far better understanding of the design space.

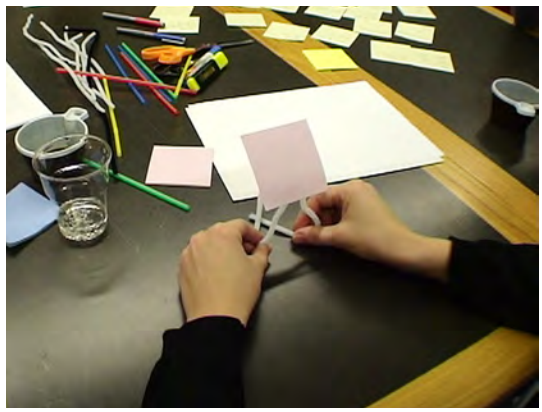


Figure 8. A woman attaches a Post-it note to a bent steel wire to explore how to interact with the display part of the phone. She draws on her familiar practices. She does this by 'doing', by trying it out in practice, not in verbal discourse.

Proposing future interaction based on embodied knowing

In this part of the thesis, I am interested in discussing how current ways of interacting with an artefact can inspire future use. One way to explore this is to focus on embodied knowing. When we interact with unfamiliar artefacts, it is our embodied knowing that 'proposes' action. What if a person could interact with a new artefact that affords ways of interaction that are similar to those for a familiar one? My hypothesis is that, if that were possible, the person could stay focussed on the task without having to interrupt and reflect. They would not experience a breakdown.

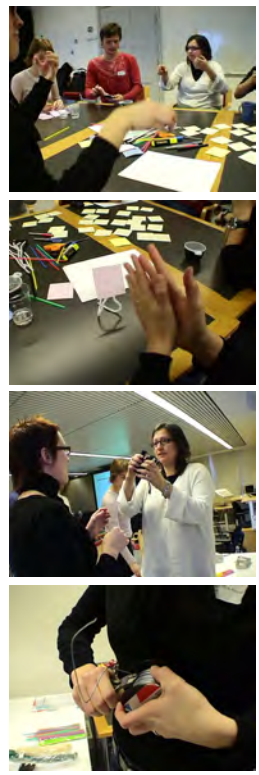
In my introduction I described the woman who tested the prototype for the toothpick holder (page 11). Her behaviour can be explained by noting that she had a way of dealing with artefacts that needed force. Since she could not use her weak hands she normally used her elbows or knees. When she was asked to insert a toothpick in the handle, she realised that she could not press it open with her hand, so her embodied knowing led her to press the handle open with her elbow. This worked well with some of our proposals.

The structure and cueing of the workshop seem to support the participants in employing their embodied knowing when they propose interactions with future artefacts. Observing this, we can identify it as their *theory-in-use* (Argyris & Schön 1974). That is, the participants propose the desired future interaction directly from their embodied knowing without having to verbalise their engagement into an *espoused theory*, a theory that Argyris and Schön have shown can be irrelevant.

On some occasions this might not be the preferred way to interact with an artefact, but that will surely be considered during the design process. This might occur when we are designing with a critical or pervasive approach or when, for some reason, we want the user to actively notice the artefact or to enact breakdowns.

In order to study this further, let us take a look at the video of the workshops on future mobile video telephony (video 1, publication 3) and follow the work with the proposal for 'two users of the phone'. The participants wanted to show how the proposed interpreting service created a different way of using the telephone compared to the intended way. Early in the workshop one woman stuck a post-it note to a bent steel wire to explore how to interact with the display part of the phone. See figure 8. In order to manage the unfamiliar future interaction, she drew on a familiar practice. She did this by 'doing', by trying it out in practice, not in verbal discourse.

Video 1, Two users of a mobile phone



We had invited sign speakers and other relevant stakeholders to workshops aimed at creating proposals for future uses of mobile video telephony. We tried to get the whole chain of necessary people to participate; in addition to the sign speakers, our participants included manufacturers of mobile phones, service providers, the Swedish Post and Telecom Agency (PTS) and employees of from interpreting services. In addition, four interpreters were enabling the dialogues but they do not regard themselves as participants since their role is to support other people.

Many ideas revolved around the emerging possibility of using the mobile phone for an interpretation-on-demand service. This would mean that a signer could call the service at any moment and get a translation from sign to voice and vice versa.

During the discussions and when the participants envisioned the scenarios they realised that when the mobile phone is used for interpretation-on-demand it has two users: one person is using the sound elements (microphone and loudspeaker) while the other person would use the video (camera and screen). But the current configuration of phones only supports use by one person at a time.

During the initial discussions many ideas for capturing and displaying hand gestures were created and discussed, along with several ideas for phones that could be used by two people at once. Different experiences lead to two proposals for how to

cope with this. In order to show these proposals the groups explored different scenarios and props that they thought would work.

In the work on actualising these proposals the participants used their whole bodies, as they explored how to hold and manoeuvre the phone props in ways that they judged would work well. They tested how the interaction between several users seemed to work. Their experience provided important guidance in these explorations.

Video 10 & 1, Wireless screen

One group created a phone that could be split into two parts. During the work they took a Polaroid photo of the interpreter-in-the-phone and glued it on to what was to be the video part.

This video prototype proposal that they created was to be located in a clothing store. A woman wants to ask the shop assistant if a specific belt is available in size 85. She approaches the shop assistant holding the belt and her mobile phone. Then she splits her phone into two parts and gives the sound part to the shop assistant and places the video part on the counter while calling the interpreter. The signer holds the belt so that the shop assistant can see it and signs the question to the video part of the phone, i.e. to the interpreter. The interpreter then asks the shop assistant:

– Do you have this belt in size 85?

The shop assistant says:

– No. I'm sorry.

Video 11 & 1, The integrated head set

The phone in the other video prototype has a separate headset. Such headsets are of course available today but this way of using them is different. In this proposal a signer wants to ask a civil servant at the Försäkringskassan (The Swedish Social Insurance Agency) about insurance for children. His surroundings are very noisy and neither the interpreter-in-the-phone nor the civil servant can hear the other very well. In this proposal the signer takes a small headset from the phone and gives it to the civil servant; then the conversation can continue without trouble.

It is interesting to note that in both of these video prototypes the person approached by the signer initially acts slightly confused with respect to the interaction with the prop. This illustrates that they are not familiar either with the service or with this use of the proposed phones and service. In these scenarios the signers need to teach the

others how to use the communication artefacts. Clearly, the creators of the proposals are showing that they understand how the prospective future users of the phone would understand the artefact. Klaus Krippendorff calls this *second-order understanding,* i.e. an understanding of the user's understanding (2006:65). This knowing is mostly non-verbal and the interaction with the props makes this visually clear.

The creation of props, prototypes, actualisation, and thinking is integrated

It is important to keep the participants in a seriously playful and open-minded attitude in order to get them to actually build the necessary artefacts that will be used as props in the visualisations. Props are things that are used to make the video prototype. It is crucial that the participants understand that 'we can all contribute to the design work'. They all share their inexperience with creating props and the other materials that are needed.

These artefacts are crucial from two points of view. First they are needed so that the video will make sense to the people watching it later. But the second reason is perhaps even more important: it connects the future use to their current embodied knowing.

When participants start to interact with the props they are building, they also relate to their previous embodied knowing (lived experience). This will unconsciously guide the design work into a relevant proposal. The material 'talks back' (Schön 1983:79) during the creation and in this process the user guides the design through a 'reflective conversation with the situation' (:242) using her embodied knowing. *Talk back* is a figure of speech and actually implies a reflection on a combination of experience, interpretation, index, affordance and the

Figure 9. Photo of the preparation for the 'Communicating with a hologram' video prototype. From Publication 3 (video 1).

scenario at hand. Here, the reflection is on what differences would be interesting to try.

The material supports different stakeholders in working together since it facilitates discussions with more dimensions than just language. The props can be seen as vehicles for communicating about desired interaction; thus they support showing aspects that are not easy to verbalise. This is critically important since it allows all the participants both to create this knowledge and also to communicate and elaborate on the interfaces. Otherwise these aspects would not be available for reflection.

This dialogical reflection with artefacts is fundamental to design work. Gedenryd (1998) believes that the creation of prototypes and thinking are integrated into one activity and should not be regarded as two separate ones. For example, sketching has a far more prominent role than just plotting down what one thinks of; since it becomes part of the very process of thinking, it influences what we have in mind. Säljö (2000) emphasises the need for creation and interaction with artefacts in order to communicate socially regarding our embodied knowing. These other issues are critical for a process of actualisation to take place, since these are ways that we can socially communicate the multiplicities of ideas.

In the example below, a group of participants were preparing to create a video prototype of a person having a conversation with a hologram.

Video 1, Preparing to shoot Talking to a hologram
During one of the workshops with sign speakers and video telephony, one signer pursued the idea of communicating via holograms; he claimed that this would provide a strong feeling of presence. Communication in which we see the other's entire body provides so much more information than a cropped torso.

While setting up the camera in order to "trick film" this video prototype, one of the participants tests where he should hold his hand so that it will look as if he is patting the man 'on the phone' on the head (see figure 9). Then he gets the idea that he could 'end' the conversation by simply pressing the other man's hologram into the phone. This is one account of an idea that clearly was created while interacting with the material.

These examples show that although the work with props, prototypes and scenarios is focussed and has aims, it does not follow strict plans. It is obvious that the process is open to new knowledge and understanding that is created during the activities. This knowledge, which is

created through experience from and activities by the participants, has a direct impact on the actualisation work.

In the example below, a ready-made prop worked well in illustrating the scenario.

Video 12, Shopping at the café

In the same workshop series as described earlier (vp 7) where the participants were adults with cognitive disabilities, a woman explained how she always forgets what others ask her to do. After some discussion, they created a scenario where she needs to remember to buy some things from a cafe.

In this video prototype we see one woman who says that she is going to the café to buy cigarettes. One of her workmates asks her to purchase a few items for him as well, and he names them. When the woman comes to the café she has forgotten what the friend asked for.

This was an account for the present situation; the video then continued with a more desirable version:

The beginning is the same except that when the friend at work starts to list what he wants, the woman starts a recording device. And when she arrives at the café she plays back this recording. This way she can bring back all the items.

This suggested solution seems to address many of the aspects that were identified as critical incidents, or important events, which was how we talked about it. The recorder would enable her to perform in a way that would feel comfortable. She could then interact with other people at her workplace in ways that they would expect. Of course she would have to remember to bring the recorder.

When the participants were preparing to record this scenario they realised that they needed something to show the use of the recording device. Instead of creating something they picked up an available object of an appropriate size: a tape dispenser (see figure 10).

At first I was a little disappointed over the use of the tape dispenser and thought that it would have been more rewarding if we would have worked on creating a 'proper' prototype of the recording device. But from hindsight it appears to be very relevant and actually more interesting on a theoretical level. The tape dispenser is relevant because it does not do anything irrelevant, and it did not take a lot of extra time and distract the participants in their actualisation.

Most people will likely understand what is 'happening' in the video prototype and also understand that the tape dispenser is supposed to work as a sound recorder. But it is also rather obvious that, as such, the tape dispenser is not much help on its own if one were to design such a recorder.

Props in the context of the workshops

In the case above and other cases the artefact itself is not of much use as a 'prototype' unless we know where it was created, and its intended affordance and use. Therefore it is a good idea to use the concept *prop* since the tape dispenser in the video prototype was used to support the actor in communicating his intended interaction.

The paper boxes that are used as Sound caps in *Happy company, without disturbance* (page 91, vp 8) provide another example where the actual artefacts themselves are of little use for the future design work. But they are necessary as props in the video in order to support the participants in articulating the interaction, the interface.

The props help to illustrate activities and affordances that are not easy to verbalise. Although the intended meaningful use should be easy to understand by watching the video prototype, a deeper understanding is normally only available to the participants of the workshop since they have experienced its creation firsthand. They are aware of the multiple ideas and other issues that were discussed while they created the proposal.

The props are important to support the work of creating of the video prototypes but also as illustrations for the audience. The props do not represent a thing; instead they facilitate the work of constituting the desired interaction.

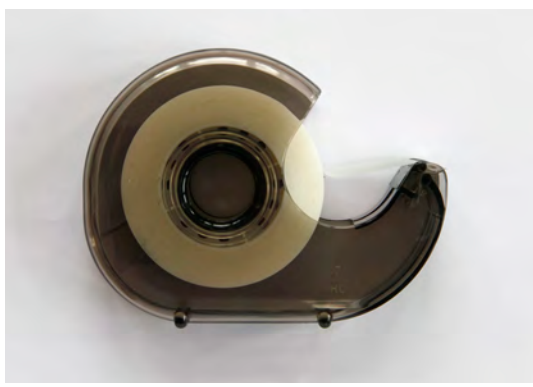


Figure 10. Ceci n'est pas une prototype. This photo of a tape dispenser does not show a prototype. It does show a dispenser similar to the one used in the video prototype 'Shopping at the café'. There it worked as an integral part of the attempt to show what seems meaningful to use in similar situations. The dispenser can be described as a prop that enables the actors to communicate desired interactions that are not easy to verbalise.

Proposals in the context of the workshops

Krippendorff (2008) suggests that designers should think of their work as *design proposals* in order to understand what they need to communicate to stakeholders. I want to investigate whether the concept of proposal can be used also in relation to the video prototypes that the participants create. Looking at the example *Happy company* (page 91, vp 8) we see that it could have been created to meet these proposal conditions. It is clearly grounded in needs and desires in reality (*sincerity*), and we see how it could be changed to more desirable situations (*essential*). In the video we see that meaningful possibilities are afforded (*motivational*). We may hesitate when we see the exact implementation, but it is clear that the participants seem to welcome the affordances (*preparatory, and political/societal*).

Some of the participants did not think a few of the video prototypes were very interesting. When we analyse them using the proposal conditions we understand that most of them do not meet the conditions of sincerity and motivation. This is probably because they are not grounded in the experience of the participants and therefore give a rather general view of some situation and future suggestion.

An example is the *Gas alarm* video prototype (page 94, vp 9), which was created during the workshops with the deaf sign speakers on the topic of mobile video communication. Analysing this video prototype with the help of the proposal conditions, we get the following result. *Essential condition*: The video gives accounts of how a signer might understand an announcement regarding a critical gas leak. *Preparatory condition:* The person involved can act in the proposed way. *Sincerity condition:* The proposal is not grounded in anyone's real desire although we easily recognise the importance of having this kind of information reach everyone. *Motivational condition:* The video prototype illustrates meaningful possibilities. *Political/societal condition:* No other stakeholders were present besides the recipient of the message.

Although it deals with a meaningful aspect the scenario is very simple and meets only a few of the proposal conditions. It actually does not illustrate more than a verbal account could communicate. The scenario is valuable, however, in relation to the other thirteen video prototypes that were created during the two workshops on this issue, since it contributes to a broader understanding of the design space. But in the discussion here, of the pros and cons of the workshop method and the ways it has been conducted, it is fair to say that this video prototype *Gas alarm* does not make a large contribution.

From this brief discussion it seems that the concept of proposal can be used to reflect on the created video prototypes and the possibility of them having an impact on stakeholders 'downstream'.

Props, prototypes and proposals as useful concepts

Christiane Floyd (1984) describes prototypes as learning vehicles, which is an interesting usage; however, virtually all the concepts discussed earlier in the chapter *Context*, page 45, can be seen as learning vehicles; therefore the term does not provide enough clarifying power to justify using it to distinguish the video prototypes from the other artefacts.

Moreover, many of those concepts have overlapping definitions. The objective here is merely to decide on a vocabulary that can communicate the differences between the artefacts created and used during the reality-based video prototyping workshops. How are the concepts props, proposals and prototypes related?

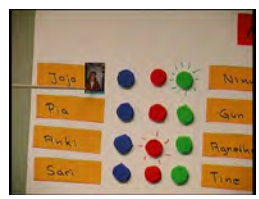
The participants create and use *props* as vehicles to communicate about interaction in the *video prototypes*. The props are important since they support communication regarding aspects that are not easy to verbalise. The video prototypes can be seen as *prototypes* in the way the concept currently is used in HCI and interaction design. The video prototypes themselves could be seen as *design proposals* for desired interfaces.

Props, prototypes and *proposals* provide a vocabulary that works when we need to discuss the different artefacts created during the workshops. But there are some difficulties with the terms 'traditional prototype concepts' and the 'proposal concept' since they do not fully take into account the context, activities and temporal aspects in relation to the interaction with the artefact, i.e. the interface. It is obvious that people creating the video prototypes have first-hand experience of the multiplicity of judgments, opportunities and other circumstances during the actualisation and will always be in a better position when it comes to understanding the proposal. One reason for this is that they could use the combination of the video and the created props to communicate ideas that often are not easy to verbalise. The use of the props shown on the video is meaningful within the group but an outsider who sees only the video prototype may not understand as much. However, if they see several video prototypes that discuss similar situations and their use, they will likely find it easier to understand.

In order to study this further, I will reflect on the video *Happy company, without disturbance* together with another video prototype created in the same project, *Relieving pressure*.

Some weeks after the workshop where the participants created the proposal for *Happy company, without disturbance* we gathered most of the employees from all three workplaces in our lab at CID, KTH for a joint workshop. This workshop was intended to focus on the work activities and their contexts. The participants were divided into five groups; each group included people from all three worksites who worked together and created proposals that were video prototyped.

Several of the proposals that they created showed the advantages of collaborating with other workplaces to construct a feeling of presence in relation to colleagues at the other workplaces.



Video 13, Relieving pressure
In the story shown the employee receives a call that she finds upsetting and wants to talk about it with someone, but all the others are occupied and their most immediate supervisor, who works on the mainland, is also occupied. She looks over to the display and understands that Jojo on another island is available to talk to.
In this proposal, the notion of presence is enabled by displays where all the employees' names are visible, along with three lamps that show the person's current activity and availability.

At first glance, the proposals *Happy company, without disturbance* and *Relieving Pressure* with their respective props, 'Sound Caps' and 'Availability Display', seem to be very different. But they can also be thought of as elaborating the same desire: to have a relaxing chat with someone. In order to have that conversation one needs to understand who is available and interested at the moment. This is the desired affordance of both the 'Sound Caps' and the 'Availability Display' if we see them not as representing specific solutions but instead as *discussing the idea*, showing their creators' intentions. The flags on the caps and the shining light on the display both mediate the colleague's situation.

This way of reflecting on the proposals, as contributions to a discussion instead of representations for a solution, takes advantage of the multiplicity of ideas. One important aspect is to focus on is the difference between the present and the proposed, in all aspects. This difference is the key to analysing the proposals and opens up a con-

structive creation of understanding. This is totally contrary to regarding them as representations of a possible future solution, which would surely constrain the possible ways of understanding how to make further use of the artefact and activity.

The two proposals mentioned above and the present situation have several elements in common: they illustrate the need and desire to have conversations at times of one's own choice. To facilitate that requires information about who is available. Moreover, the other workers should not be disturbed. This means that the interaction with the artefact should not take attention away from the desired activity. All these experiences and actions are different in the proposals compared with the present situation at the call centres. This can provide a foundation for further proposals to improve the experience at the workplace.

In addition to being seen as proposals, the video prototypes can contribute to our understanding of the participants' situation, preferences, capacities, experienced problems and overall context. This can also be very valuable in the design work. One example from the K Project is an account for issues related to the dependence on ferries; see figure 7.

This discussion suggests that the workshop should be seen as a dialogue where the participants in the workshop show what they regard as meaningful for themselves. The workshop takes place, or is constituted, when people engage in actions that others respond to, and also through the mutual interaction. In this 'dialogue' the participants really 'say' a lot. When reflected upon openly the 'dialogue' can create a great amount of knowledge that is useful for understanding the possibilities of desirable future interaction, interfaces.

What is actualised into the video prototypes?

The proposals that were created during the workshops discussed here differ from one another considerably; they range from blue-sky suggestions like teleports and communication with holograms to artefacts that are more or less available already, like recording devices. They are both virtual and physical. One proposal suggests a new ministry to ensure that television and all other broadcast media be accessible, and people in the same workshop proposed a remote control.

Most of the proposals dealt with issues that participants considered problematic but others offered ideas for praising people who do well at work.

Some seem like proposals for minor enhancements, like making it possible to type numbers in video mode on a 3G phone; others are quite overwhelming such as changing laws or regulations or implementing tax cuts to enable people to live permanently in rural but attractive areas in the archipelago.

Many proposals deal with the same issue, each one elaborating more on some aspect or from another standpoint. Examples include proposals for e-payment in different settings (vp 4). These proposals are very different since they focus on a solution for a particular person and setting and it seems impossible to find a compromise that would work for everyone in all contexts. But looking more closely at the more advanced proposals, we see ideas for standardisation at the back stage that meanwhile support personalisation of the front stage or touchpoint. This would make it possible to afford interaction for many people with different needs and desires.

This multiplicity of proposals supports an understanding of the design space, i.e. of the proposals that would 'work'. It is also good to keep this in mind when analysing individual video prototypes, to see them as one contribution to understanding the *design space* for the specific area in focus. For example this is true of the thirteen video prototypes that were created during two workshops that investigated ways to make digital TV accessible to all people. The solutions varied from working with the ministry to ensure accessibility to designing remote controls (vp 3); taken together, the many other proposals that lie somewhere 'in between' help us understand how to provide better availability for digital TV. This design space is large since the initial 'question' was very open.

Since one foundation for the workshops is the lived experience of the participants, it would not have been surprising to see that the ideas were very constrained to the current practice, but this overview shows that the participants seem to leverage each other into proposing and actualising quite unexpected solutions, different from the current situation and practice.

What is not actualised?

It is more of a hypothetical question to discuss what was not proposed during the workshops since there are so many fields, problematic areas and opportunities that we did not have the opportunity to consider. None of the proposals had the objective of making things worse for someone else and only a few elaborated on possible conflicts.

Most of the video prototypes are rather sketchy and rough and no fully articulated proposals were created. Though time constraints are important, I think that is not the only issue; it is also a matter of knowledge and skills. It takes a whole team of experienced professionals, and considerable time, to create a 'complete' proposal for a product.

Actualisation in relation to design at large

In this thesis I have been discussing aspects that are critical to cooperatively generating meaningful proposals. This is an extremely important activity but the reality-based video prototyping workshop method is only one of many ways to generate these. I fully acknowledge that this can be done in many other ways.

Although this initial design activity is crucial and must be conducted as a process of actualisation, this does not mean the end of alternative, temporary solutions. Much work remains to be done and many obstacles to be cleared and gates to be opened before any of the ideas can be further designed and produced. Work must be done to actualise the proposal, from discussing a particular activity to making it afford a wide range of settings. While the approach in the design process will tend to be more and more experimental, it will not slip into a process of realisation at any point since that could seriously endanger the work.

This implies that the normally used development processes, which are tightly planned, and involve division of labour, tossing-over-walls, outsourcing, etc. will not work well: they are heavily rooted in a *process of realisation* and the learning that happens is primarily related to *model I activity*, i.e. a self-sealed, rational approach that avoids criticism and public testing (Argyris & Schön 1974). The danger here is that in each 'new step', there will not be any difference to the idea. They will not improve because people avoid all the fruitful discussions regarding dilemmas, as a result of the governing variables underlying model I action. They tend to avoid expressing negative feelings and discourage reflection.

In order to achieve continuous improvement throughout the process all the activities constituting a design process need to be a *process of actualisation*.

It is crucial to distinguish between props, prototypes, and proposals, and to acknowledge that they are non-representational. Instead they should be seen as constituting a statement or other aspect in a 'dialogue'. This way of reflecting on the proposals – as contributions to a discussion instead of representations of a solution – takes advantage

of the multiplicity of ideas. One important element to focus on is the difference between the present and the proposed, in all aspects. This difference is the key for analysing the proposals and it opens up a constructive creation of understanding.

Aspects of the workshop's process

In this chapter I discussed the critical importance of establishing and supporting a *process of actualisation* in order to support others in understanding the design space as they generate several video prototypes.

I have also studied the importance of physical interaction as people create props and prototypes since it supports the co-operative use of, reflection on and illustration of embodied knowing.

To summarise the workshop process using concepts described in the current chapter, the participants co-operatively create *proposals* in ways that are open to influences and experience during the process. This includes multiplicities of aspects and considerations. Proposals that the participants regard as interesting and meaningful are *actualised* into *video prototypes*. These video prototypes demonstrate desirable future interactions with the support of *props*.

Designers are typically good at supporting a creative process and are comfortable with making decisions from incomplete information. They have an optimistic approach that involves public testing, and takes advantage of possibilities that are created during the design process.

Reflections

In this part, with one final chapter, I create connections between the three aspects I explored in the previous chapters: the participants' co-operative activities, the activities of the designer/conductor, and the nature of the work done during the workshops. I reflect on the issues that I consider to be critically important, and connect them into a few overall views on the workshop activities and results.

Reflections and connecting critical issues

Three aspects within the workshop process

I have shown that the workshop method prepares for and can support a co-operative design process. This can be seen as a process of co-operative learning and doing where the participants create knowledge regarding desired interactions with future artefacts. "Knowledge in this context is different ways to act and communicate that seem stable and meaningful, and that have come to be acknowledged socially in a particular context" (Rostvall & Selander 2008:13 my translation). This means that the knowledge is socially constructed, is negotiable, and depends strongly on the context and the participants.

During the workshops the participants question current practices and explore opportunities they co-operatively create and understand. Not only do they co-operatively create video prototypes where they show interaction with artefacts that would make their life easier, better, more productive or enjoyable in some sense; they also create knowledge concerning the situations and practices at hand, and their understanding of each others' circumstances, preferences, knowledge and contexts. The workshop method is empowering and enables the participants to explore, understand, formulate, articulate, illustrate and communicate desirable differences. I find the way the method encourages the participants to engage with each other very inspiring, and many of the video prototypes show this engagement. Some examples are *Happy Company, Buying Bedclothes and Lego Remote* (vp 8, 4, 3).

Together with other proposals, these video prototypes help us to understand the *design space* that currently is being explored. The multiplicity of proposals makes available a far better understanding of the opportunities and the differences that are desired. Here I am thinking of the video prototype *Relieving pressure* (vp3), and others that complement *Happy company*. Together they inhabit the design space of the proposals to enhance activities and situations at the workplaces involved in the K Project. The video prototype *Ragnar sells a sofa* (vp 6) deals with issues similar to those in the two video prototypes exploring *Two users of a phone* (vp 10 & 11). Thus, all three improve our understanding of the design space where future mobile video telephony supports sign speakers.

I have also shown and discussed video prototypes that were regarded as not very good proposals at the time and in the particular

context. Of course it is possible to learn from everything, but here I see the quality issue in the following way. Three conditions can indicate that the video prototypes are probably not that good. They may not fulfil the design proposal conditions (page 48)(Krippendorff 2008) which will make it difficult to engage others in further work on them. They may fail to contribute a new idea, or they may not make full use of the video prototype technique if the idea can be more easily described in speech or writing. These are the conditions I use here to consider the quality of a video prototype. Two examples of video prototypes that are of lower quality if seen this way are *Gas alarm* (vp 9) and *Chipped* (vp 5).

Although these video prototypes did not contribute much during the workshops, in the context of this thesis they are assets since they make it possible to understand differences between those that are regarded as successful and those of lower quality.

Having considered the quality of the video prototypes, and discussed the activities, conditions and processes under which they were created, I now explore the relations between them. Therefore I look for differences between the conditions under which the high-quality, and the low-quality, proposals were created.

In the process of creating the higher-quality proposals, the activities could be described as *model II* using the Argyris and Schön theory (1994). In these activities the participants are minimally defensive, learn from each other through open discussions, and publicly confront and test ideas. They trust each other and work effectively with difficult issues (:87). Using Grosz' theory (1999) the activities would be understood as *processes of actualisation,* which means truly innovative processing where participants can create multiple proposals. It is likely that the participants *frame* these activities as creative, playful and meaningful.

The perspectives of Argyris and Schön and of Grosz originate from different theoretical approaches, and are not fully compatible. I use them in order to differently describe and illustrate two aspects of the workshop I have chosen to explore; one focuses on the participants, and the other on the process.

Considering the video prototypes that were considered to be of lower quality, meaning that they did not greatly support an understanding of the design space, the activities leading to them can be described as *model I* and a *process of realisation*. In model I theory of action the behaviour is defensive, and the activities are seen as self-sealing and are constrained to single-loop learning. A process of reali-

sation involves limitation, and narrowing down possibilities, thereby only realising a previously existing plan.

Looking at the third aspect, at the designer/conductor's activities, it seems clear that in these latter cases we did not succeed in providing conditions for creative co-operation. We did not provide cues that made it possible to key the activity into creative frameworks.

This implies that in order to support the understanding of the design space by generating several video prototypes it is critically important for the designer/conductor to pay *attention* to and support a *model II theory of action* as well as a *process of actualisation*. This means that the participants need to trust each other and appreciate everyone else's contributions. One way for the conductor to achieve this is to attend to the participants' framing and to provide cues that support keying them in creative, seriously playful and open frames; this supports the participants in suggesting and creating proposals.

In the context of the workshop many of the participants do not feel comfortable with this *abductive* approach (page 34), that is, suggesting 'what ought to be' without 'sufficient' information. Normally they do not want to proceed to create articulated, particular *proposals* until they are certain they have 'the solution', an idea that will really work. Therefore they need support and guidance from the designer/conductor. Success lies in pushing the participants just as much as necessary and no more. It is crucial that they feel committed to the actualisation; they must feel responsibility, and seize the opportunity. This implies that the designer has to pay great *attention* to attitudes and values that can stop or threaten this *process of actualisation.*

This situation is critical and must be avoided or resolved. For example, we would have to discourage the governing variables of *model I* since these are contradictory to those of the desired *model II actions*. This means that when we notice that participants want to *define goals and try to achieve them,* to *maximise winning and minimise losing,* to *minimise generating or expressing negative feelings*, and to *be rational,* we have to help them to abandon that way of thinking. Some participants find this rather contradictory and problematic since these values are acknowledged throughout society; meanwhile, according to Agyris and Schön, they do not support *model II theory of action*, double-loop learning or the creative process that is necessary to focus creatively on desirable future interfaces.

Strong and continuous focus on the new, the futures desired

Designers per se are not very interested in the past or the present, only as a way of learning about possible future activities, about *desirable differences*. This is also true for the workshops: although they certainly depart from *embodied experiences* they go on quickly to work with physical *props* that support focusing on *future interfaces*.

The props are vehicles for communicating about desired interactions; they make it possible to illustrate opportunities within the interaction that are not easy to verbalise. Otherwise they would not be available for reflection. This is fundamental for learning and reflection.

It is important to support the participants in creating *particular* proposals. If the interaction is particular and specific, it will be more related to their *embodied knowing* and the interaction that is shown tends to be more detailed. Another advantage is that this is a great way to cope with *complexity*. Sticking to the way one person would want to get something done in one particular context at one time provides a great deal of constraint on the event.

Paying attention

The workshop method itself consists explicitly of phases that guide the work: narratives of critical incidents, ideation, creating props and video prototypes, and reflection. But this list is not all we need to conduct a workshop successfully. That is why I suggest using the word 'attention' that I regard as a more active way of reflecting-in-action. This attention is a conscious conducting, constituted by the advice and guidance of participants and other dialogues with them.

Molander (1996) says that one can learn to pay attention. Some tips for constituting this attention are "curiosity, willingness to articulate and explore purposes, humility, participation" (Marshall & Reason 2007:3). Heron (1996:118) adds "being present, imaginal openness, bracketing of several kinds and reframing" and "a radical kind of participative awareness" (:128). These are very wide and imprecise but still give some hints about how we can practice and constitute attention.

Participants constitute, not represent, desirable differences

The work with this thesis has brought me to the point where I have had to reconsider how to discuss and relate to artefacts and activities. I

have learnt the value of regarding activities and artefacts as constituting instead of seeing them as representing.

In the proposals it is apparent that the ideas for new interfaces cannot be representations since they do not yet exist. This is emphasised by the discussion in relation to prototypes (page 45), where I also emphasise that artefacts in general should not be regarded as representations or communicative signs. Instead we should understand that the user constitutes the experienced meaning in a specific context. This strongly supports a non-representational approach, with a focus on what the prototypes afford, how they are part of the constitution of the design work.

This constitutive approach contributes productive perspectives on how to interpret the video prototypes as well as the artefacts used in them. Seeing them not as representations of a future solution but instead as proposals, temporary contributions to a discussion, one can see behind the rhetoric and analyse them in 'dialogue' with other proposals that consider the same design space. It is possible to argue against proposals; they do not represent a final solution and therefore should not be read as requirements. The proposals do not represent needs or desires; instead they identify and illustrate desirable differences, as they are particular proposals in the design space.

The work with the scenario *Claudia goes to Belfast* (page 73) is a good example since the proposal was immediately categorised and interpreted as science fiction by other project members who did not understand its dialogical aspect.

As one consequence of the constitutive approach, we recognise that created artefacts are *props* and not prototypes. Among the examples are the tape dispenser (figure 10) in *Shopping at the café* (vp 12) and the boxes that were used in *Happy company...* (vp 8). These props facilitated the video prototype, and must be analysed in that context.

The 'design space' model

The *design space* model (as it is described in Publication 2 and in *Context,* page 35) works as a conceptual tool during the workshops in order to *aim* the design work toward desirable futures. It also works to account for and reflect on the activities. During the workshop, this model acknowledges the idea that many different proposals could 'solve the problem', and therefore supports creating, and analysing, a multiplicity of proposals. This fundamentally supports *model II theory of action* and *a process of actualisation*.

The design space model works far better for describing the design process than descriptions using funnel metaphors. Funnel-oriented models emphasise the idea that there is one *goal*, one solution. During design work, the funnel metaphor also tends to promote the reduction of possibilities and consensus, not diversity. This fundamentally supports *model I action* and *a process of realisation*.

The difference between focusing on an *aim*, and defining a *goal,* has several critical consequences. When we are aim-oriented we are open to learning more about what is in focus; if we set a goal, we tend to act as if we already have enough knowledge. In the latter case we make decisions without enough information; in the former case, we are aware that we do not have enough information. Harold Nelson and Erik Stolterman discuss goals and aims, and connect aims with intention: "intention is not the target, nor the purpose, nor the end state, but is principally the *process of giving direction*. This distinction is an important one in design" (Nelson & Stolterman 2003:143).

Keeping the process aim-oriented supports the interaction between the participants while articulating and creating multiple proposals in the design space. This in turn enhances the overall understanding of the design space.

Implications for design

Several of the major reflections above can have implications for design and include issues that are worth further study.

The combination of *model II governing variables* and the *process of actualisation* should also be explored in other design activities, in addition to the workshops. Examples can be found whenever several persons work together, in contemporary professional design work and within the emerging field of 'social innovation'. The *setting* suggests a process that is very open, so participants can take advantage of opportunities they recognise or create during the work. The quite common focus on aims and requirements is not supported by these theories. This also seems to be at odds with outsourcing, where the focus is primarily on requirements, and the parties can have contradictory interests, at least economically.

During the design process, the *Design space* model should be used to focus the work in a relevant way on desired futures since it fundamentally supports *model II theory of action* and a *process of actualisation*.

The *non-representative* approach to analysis of artefacts can support a better understanding of props, prototypes and proposals in general.

Attention seems necessary during co-operative design work in order to initiate and maintain a *process of actualisation*. The attention should provide cues that help participants frame the event in ways that benefit the co-creative process, and support the creation of relevant proposals through attention to narratives, etc.

Attention is a good concept to support and understand how to support knowing and doing during co-operative design processes. I see it as a bridge between the methodical and the intuitive approaches.

Shifting back to being within the design process

When I return to my inspiration (page 15), the test of the toothpick holder, along with the blank model method and the workshop method, and reflect on them with the knowledge I have after writing this thesis, I see familiarities. Looking at the videos by Richard Mander and Michael Arent (1994)[4] showing the blank model method in use, I see some resemblance to our testing of the model for the toothpick handle. Most of the resemblance lies in the approach: inquiring cautiously. We never articulated our approach as a specific method; rather, it was practically oriented, based on our experienced need to understand. It was a listening and inquiring approach, wondering how an item should be designed in order to work adequately. The result we later proposed was considered to be successful, thanks to the woman's engagement in which she used her *embodied experience* and showed us her *theory-in-use* related to the handle.

Mander and Arent had a professionally developed method: they consciously and deliberately paid *attention*, supporting the explorers so they would succeed in sustaining a process that was similar to a *process of actualisation*. The activity was quite controlled.

The interLiving workshops were not so controlled. There, the attention was less on the method and more on including people in the co-operative explorations. The primary aim was to create an understanding of what might improve the communication within these specific families. This was also quite a practical, inquiring approach.

All these approaches can be regarded as explorations of respective *design space*.

Having shifted position from this practice-based position to one of analysis *of* the workshops, I now have a deeper and wider understanding of why and how things happen the way they do; and of how to verbalise, attend to and reflect on the preparations, the activities and

4 Thank you Apple for a sustainable QuickTime.

the results. I also have a clearer understanding of my own role and possibilities during the activities.

I now look forward to returning to the work itself, where I can be *within* challenging co-operative design activities, and also use these theories and understanding in order to inquire into new contexts and desired interactions with future artefacts, and to explore design spaces.

Concepts used

Here are accounts for some of the concepts I use in this thesis and what they are intended to mean here. Some have a range of definitions or views on what the concept could mean.

Actualisation: During a *process of actualisation* (Deleuze 1994), the participants pay attention continuously during the process and explore the opportunities that are created. "The process of actualization is one of genuine creativity and innovation ... The lines of actualization of virtuality are divergent, creating multiplicities, the varieties that constitute creative evolution" (Grosz 1999:27).

Aesthetic: In this text the concept of aesthetic emphasises the wholeness of an experience: aesthetic as a whole, complex and intense experience. John Dewey writes about "the esthetic quality that rounds out an experience into completeness and unity as emotional."([1934] 2005:43).

Affordance: James Gibson coined the concept *affordance* in order to describe what living creatures understand they can do with some thing (1979). Affordances are properties of the object or artefact in relation to someone's understanding on a given occasion. This means that affordances are not universal. Donald Norman, Bill Gaver, Klaus Krippendorff and several others have also elaborated this concept. See also page 42.

Artefact: Artefact is used as something that is made by humans, and can be both physical like chairs or virtual like habits or services.

Breakdown: A breakdown occurs when an artefact does not afford our actions in relation to it. Klaus Kripppendorff says that it "is the meaningfulness of the interface of which we are part" that breaks down (1996:84). The concept originates from Martin Heidegger.

Communication: Communication is created between people. Although artefacts can mediate the communication I mostly regard that as indexicality. I would never say that design is communication because this could be interpreted as if the designer could 'say' something to the user and that would simplify the activity too much. Instead I

build on the argument that it is the user who interprets the designer's intention, like a communication but backwards (Crilly et al. 2008a). I refer to this as indexicality.

Design: I follow the tradition of using the concept of design to mean design activities; in this text, design is a verb. This definition emphasizes change, the difference that design work proposes. The new situation is another situation.

Klaus Krippendoff emphasizes designers' care about people's use: "Design concerns itself with the meanings artifacts can acquire by their users" (Krippendorff 1995:153), "designers are concerned with all kinds of (individual and cultural) interfaces between humans and their artifacts" (phd-design 090913).

The end result of the design work is often a *proposal* for an artefact that can support the desired difference. The proposal is aimed at being *produced* by a manufacturer, service provider or similar. I suggest that we should not talk about artefacts as a 'design' or a 'design object'. A person observing a *product* may say that it is a design but that is the person's interpretation. People also tend to say that some products are nice or ugly or whatever but this is an opinion that depends on the person, the situation and the context. These are not properties of the artefact itself.

Design space: A tool for thought, a conceptual model, that can be used both for designing and for understanding design processes. Here the design space is understood as all the possible design proposals that would be regarded as meaningful to use by some people in relevant contexts. In reality the design space is an extremely complex multi-dimensional space containing an endless number of solutions, but here the interest is only in the concept.

The design space consists of all the possible solutions; here it provides a conceptual tool illustrating what the design work is all about. It serves as something to which we can aim our intention during the whole design process, and while we work we generate an understanding of it. Still, it is important to understand that we cannot fully describe it because of its complexity and size. We cannot even be sure that the design space is one space. It might consist of several non-connected spaces (Westerlund 2005a).

Since this is a conceptual model it is not that interesting to discuss whether this space is the same for different people. Although strictly it cannot be the same for all people, in practice one can assume this when working. As an analogy, a person can talk about going to Stock-

holm, which in some sense is the same but also different for any two persons. (page 35)

Difference: The difference that one notices and talks about is not a property of the artefacts or objects; instead it is something that we people choose to identify. Gilles Deleuze (1994) argues that pure difference is non-spacio-temporal: it is an idea and he calls it the virtual. (See pages 32 and 99 for examples.)

Double-loop learning: Argyris and Schön (1974) developed this concept for action (learning) that "encourages an explicit recognition and reworking of taken-for-granted objectives" (Blackler 1995:1023). When something does not work out as we hoped, we have to consider alternatives. In double-loop learning this involves not only reflection on the possible actions, but also reflects on the governing variables. This is often contrasted with single-loop learning where only changes of action are made.

Embodied knowing, Embodied knowledge: Blackler describes embodied knowledge as "action oriented and is likely to be only partly explicit ... depends on peoples' physical presence, on sentient and sensory information, physical cues and face-to-face discussions, is acquired by doing, and is rooted in specific contexts" (1995:1024). See also *learning* page 49–52.

"Embodiment ... means being grounded in and emerging out of everyday, mundane experience" (Dourish 2004:125). It has a focus on practice; action in the world. "We find the world meaningful primarily with respect to the ways in which we act within it (:124). Embodied interaction is the property of our engagement with the world that allows us to make in meaningful" (:126).

Experience: The English word experience works as translation for two rather different concepts in Swedish. 'Upplevelse' which is experience in conjunction with activities at amusement parks, games, dancing, etc. 'Erfarenhet' which is the knowledge created over time and sometimes referred to as lived experience.

Frame: In this thesis, frames are small narratives with simple structures that are among the cognitive structures we use to think. This is the way Erwing Goffman and George Lakoff use it. See page 81.

While in the context of design the concept frame is usually used in the way Donald Schön (1983) uses it, basically to temporaily set a problem, to identify what to attend to.

Index, indexicality: "An 'index' in Piercian semiotics is a 'natural sign', that is, an entity from which the observer can make a *causal inference* of some kind, or an inference about the intentions or capabilities of another person" (Gell 1998:13). Thus, if one puts relevant questions to the artefact it is made into an *index*, which is a sign *of* something (Kjørup 2004:9). See page 44.

Interface: Interface is a relation between a human and an artefact. The "human body is as much part of an interface as the artifact interacted with" (Krippendorff 2006:79). Other scholars subscribe to this definition as well, for example Lucy Suchman (2007). But notice that some people regard the 'interface' only as a property of the artefact, but this is a completely different theoretical standpoint which is not used here.

Product: "a range of phenomena that is very broad, including information, artifacts, activities, services, and policies, as well as systems and environments" (Buchanan 2001)

Prototype: A prototype is something made in order to learn about the future situation of use, a learning vehicle (Floyd 1984). The concept of prototype has many interpretations of which some are elaborated on page 45 ff.

Prop: Short for theatrical property, an artefact that an actor uses. I use it to talk about the objects that the workshop participants use to support them when creating video prototypes.

Proposal: Klaus Krippendorff suggests using the concept of *design proposal* to discuss what designers must communicate to other stakeholders in order for them to engage in producing the results of the design work. see page 48.

Reality–based video prototyping workshop: I use the word workshop for the eality-based video prototyping workshop method, which is the subject of this thesis. Some other workshop methods are mentioned in the *Context* chapter but this should be clear from the context.

Stakeholder: This concept acknowledges that many persons are influenced by an artefact in some way or another. One could say that these persons are users, but this would not clarify the relations. See page 31.

Theory-in-use: Chris Argyris and Donald Schön distinguished between a person's *espoused theory,* i.e. how that person verbally explains how he or she does something, and what the person actually does in practice, i.e. the person's observed *theory-in-use* (1974). See page 45.

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