WAYS OF KNOWING ABOUT PRODUCT USE IN THE DESIGN PROCESS

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ABSTRACT:

Integrating of information about product use in design is generally considered useful. The challenge is to study how exactly designers use such information. Two consecutive workshops were held in which three designers worked on a design task and in which user data were presented to them. We studied how the designers used information about product use, whether the designers selected the most useful information, how they designed empathically, and how they evaluated their designs during the process. It was found that although the designers were very engaged in designing for the users, their process was inhibited by some aspects such as the form of the data presentation and the designers' view on the activities of users. The design process could be optimized so that knowledge about users can be used more effectively.

1. INTRODUCTION

1.1. WAYS OF KNOWING ABOUT PRODUCT USE IN DESIGN

There is little theoretical coherence to date about the role of knowledge about product use in the design process. The process of designers is being studied (e.g. Cross and Cross, 1995; Stempfle and Badke-Schaub, 2002), but not with an explicit focus on the designers' knowledge about product use. Yet it might be useful to know more about this. Many technology products remain insufficiently adapted to the requirements of their use. What is the reason for this? Suchman's (2003) challenging argument is that it is a matter of how designers see the design process and themselves in it:

"A recurring question for me as a participant in discussions on design (in the world of professionalized technology production) is "Who is doing what to whom here?" Within prevailing discourses anonymous and unlocatable designers, with a license afforded by their professional training, problematise the world in such a way as to make themselves indispensable to it and then discuss their obligation to intervene, in order to deliver technological solutions to equally decontextualized and consequently unlocatable users. This stance of *design from nowhere* is closely tied to the goal of construing technical systems as commodities that can be stabilized and cut loose from the sites of their production long enough to be exported *en masse* to the sites of their use."

Suchman's work is connected to the traditions of Computer Supported Collaborative Work (CSCW) and Participatory Design (PD), which tend to take a critical stance towards design and technology production.

Suchman (2003): "A crucial aspect of the alternative implied by these reconceptualizations (in CSCW and PD) is that design work becomes located; that is, we replace "ways of being nowhere while claiming to see comprehensively" (Haraway, 1991, p. 193), with "views from somewhere" (p. 196) (…). This means identifying our participation in the various mediations that define the production and use of new technologies, and taking some responsibility for them."

Suchman suggests that knowledge in the design process emerges in a design situation. Hence we focus on the situation of designing in the research reported in this paper. Our research draws furthermore on findings about the role of knowledge about product use in design. The following selective overview shows that there are still many gaps in what we know about the role of knowledge about product use in the design process.

1.2. FINDINGS FROM VARIOUS PERSPECTIVES

Kanis (2002) argues that in-depth information about product usage is more useful to designers than generalized information. By in-depth information is meant information that shows actual instances of how individual people use products, and reveals something of the ways they reason about their product usage. Information at this level of detail is important for designers in making design decisions. But the question remains: how exactly do designers use information about product use?

Boess et al (2006) argue on the basis of action research that designers need to be able to take in the information very quickly. As designers, we wanted to analyse and categorize the data quickly, because we needed to move on with the design process. We needed the data to be accessible and easy to incorporate into designing. Our findings echo those of Black (2003) that design teams need information presented in clear key points. What we don't know is: when there is little time (there rarely is a lot) and designers have to be selective, do they select the most useful kind of information to work with?

An aspect that has been cited as important in the literature is the empathy of designers with the situation of product use (e.g. Koskinen et al, 2003). It has been suggested that empathy is important in designing with due consideration for product use. But little is known yet on how exactly designers design empathically.

There are also relevant findings from research on the dynamics of the design process itself. Descriptions of the process of designers tend to portray them as primarily concerned with artifacts in their various relevant contexts (of which use is only one) (e.g. Cross and Cross 1995). Recent empirical findings on design processes suggest that the outcomes of design are better when design teams take time to evaluate their work during the process (Stempfle and Badke-Schaub, 2002). This indicates that designers probably develop and use knowledge about product use in in-process evaluations of their work. What is the role of knowledge about product use in such in-process evaluations?

1.3 TAKING UP THESE CHALLENGES: AIM OF THIS PAPER

This paper reports on an explorative study in which we take as a point of departure Suchman's challenge to focus on the design situation. We also connect Suchman's challenge to the questions raised above: how exactly do designers use information about product use? Do designers select the most useful kind of information to work with? How exactly do designers design empathically? And what is the role of knowledge about product use in in-process evaluations? These broad questions can never be answered

exhaustively. But our research aim is to provide useful information to designers for their work. We therefore connect these broad questions to a concrete situation of designing. Suchman (2007) worked her initial critique out further and developed a number of concepts that can inform our analysis. Suchman sought to indicate a truly participatory stance, reflecting locatedness and responsibility. The concepts for this are 'intra-action', 'ordering devices', 'the interface' and 'outside/ inside'. Our analysis makes use of these concepts to see how they elucidate the design situation for us. ***Intra-action*** denotes that subjects and objects emerge through their encounters with each other. This means that in design one cannot pre-assign how an object should be used and by whom. Design should regard future use as "ongoing practical, critical, and generative acts of engagement" rather than try to control interaction or abdicate such control (Suchman, 2007, p. 285-6). ***Ordering devices*** are plans, scripts, assumptions about courses of action. They serve to establish rational accountability for product use actions. They become traceable particularly where they clash with the exigencies of events. They also reveal the politics of who is expected to set them and who is expected to conform to them (Suchman 2007, p. 193). ***The interface*** in Suchman's view is a connective medium. The entities "humans" and "machines" that are being connected through it are not stable entities but are constructed through contingently enacted cuts. Within and from an interaction, it emerges how humans and machines are constructed in that interaction. A category referring to people might be e.g. gender. And things might emerge as more or less contested understandings of how they should be. These categories emerge through representations, e.g. through utterances, actions or images being generated and taken up in an interaction (Suchman 2007: 268 and 279). ***Outside or inside*** refers to the ways organisations function that are concerned with technology design. Because organisations develop internal structures and accountabilities, they become less able to look to the outside. The situation of product use often is on the outside of development processes. This means that rather than unwillingness, a kind of blindness prevents organisations from including knowledge about product use in their development processes (Suchman, 2003).

2. OUR STUDY - METHOD

2.1. OVERVIEW

We (three designer researchers) invited three other designers to join us in two consecutive design ideation workshops during which user data were presented to them. The users themselves did not participate in the design workshops. We as researchers did research into a situation of use first and interpreted the data. In preparation for the workshops, we developed an accessible format for the presentation of information on product use, in the form of cards and theme posters. At the end of the second workshop, we held a discussion with the designers to reflect on the experience of designing with information about product use.

We video-recorded the workshops and transcribed them verbatim, except for the designing part in the second workshop (for technical reasons). The recordings and transcripts were used to analyse the statements and actions of the designers.

2.2. TASK

The design task for our study is 'visual reminders in people's homes'. The topic of Visual Reminders has a strong aspect of rational accountability to it, as it is about functioning in daily life. It is also quite emotion-related because it influences the look of one's home, something that is very personal and affects how one is judged by others. Finally, a Visual Reminder is not necessarily an industrially produced artifact that somebody only 'uses'. Rather, visual reminders are produced and used by people in a great variety of ways in their home. This enables us to trace if and why a designer chooses to design something in which the initiative is with the users, or something in which the artifact exerts control over its possible uses.

2.3. PREPARATORY RESEARCH: INTERVIEWS IN USERS' HOMES

We three research team members visited two households and conducted a semi-structured interview of about an hour's duration there. The households were single people of various ages, families, couples and house sharers. We asked the participants to give us a guided tour of their house, to show us which visual reminders they used, and to explain the interactions related to these visual reminders. We did not tell people prior to our visit what the topic of the research was, to prevent them from arranging things especially for the visit. We photographed the visible visual reminders in people's homes which they indicated to us. We could not always verify to what extent people actually used these visual reminders. Besides the photographic evidence, we relied on people's own statements. The study method is reported in more detail in Boess et al (2006). Conclusions from this preparatory research were were drawn in the form of themes that emerged from the research. The themes we identified were (TIMING OF) ACTIONS WITH THE VISUAL REMINDERS, TARGET ACTIVITIES, (desired) STYLE OF INTERIOR in relation to visual reminders, ATTITUDES to visual reminders, and TYPES OF VISUAL REMINDERS. The themes and conclusions were reported in Boess et al (2006).

Figure 1: Detail photos from home visits.

2.4. TWO DESIGN IDEATION WORKSHOPS

The three designers we invited to join us in this study were also doing research at the university, but they were unfamiliar with our research. Prior to the first workshop everyone (including us) did a short design assignment: consider how people might use visual reminders at home and sketch two design ideas. This was to let everyone form ideas in their own surroundings and bring them to the workshop. An independent moderator convened both workshops. In between the two workshops there was a pause of three days. The designers should have the opportunity to gather inspiration from their own lives, now having been sensitised to the topic. The information about users (point 2.4.2.) was used in the second of the workshops. We sought to contrast how the designers talked about presumed use of their design proposals before and after they were informed about user data, and which data they used, and how. Here is an overview of the set-up of the two workshops (Table 1):

1st workshop		3 days break	2nd workshop	
3 designer researchers	3 designers		3 designer researchers	3 designers
Designing with research information	designing		providing research information, not designing	using research information, designing

Table 1: the set-up of the workshops.

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2.4.1. First workshop

In the first workshop (Fig. 2), each one of us presented their ideas to the rest of the group: what had initiated the idea, and what are the benefits. The ideas were discussed in the group in terms of probable use. Each designer selected one of their ideas to continue with it in the second workshop. We (the researchers) joined in the idea generation but revealed nothing of the user data to the designers.

Figure 2: Video still from the first workshop: presenting initial ideas.

2.4.2. Information on product use

For the second of the two design ideation workshops we prepared cards presenting the information on the users in the form of photographs, quotes and themes. The cards with user data were presented to the designers in two ways: loose, and on posters where the cards were sorted according to the themes we had identified (Figure 4). With this, we intended to make the information more easily overseeable for the designers, to give them some initial points of departure for design. Each card showed a photograph from the research, presented one or more quotes from the participant, and indicated to which theme the card belonged.
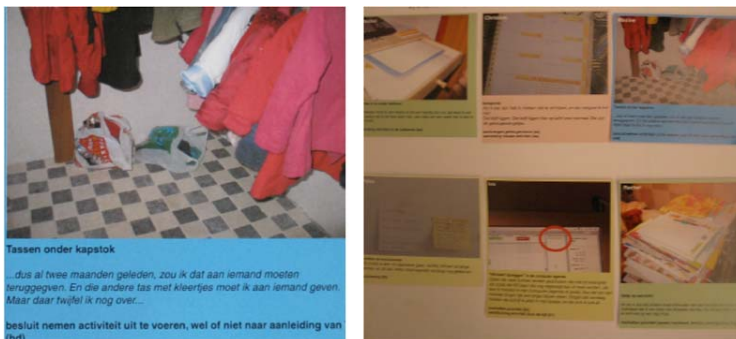

Figure 4: Photo on the left: card of a participant's hallway. The person is quoted: "so for two months, I am supposed to give this bag to someone … But I am still in doubt about that …". Theme: timing of activities. Photo on the right: a theme poster with cards showing the theme of 'timing of activities', as presented in the workshop.

2.4.3. Second workshop

In the second workshop (Fig. 3), only the three previously uninvolved designers developed ideas. The researchers acted as information sources for the data. The designers had time to look at the cards and theme posters and to read the quotes (Fig. 4). They could also ask us questions about the users. The designers were asked to pick out cards belonging to one or more users and to work with them. They had some time for designing, then presented drawings and models of their design to the group, followed by a discussion on the usefulness of the designs. At the end of the second workshop we held an open discussion evaluating both workshops, in order to understand how the designers had experienced the design work with information about users.

Figure 3: Video stills from the second workshop. Left, on the presentation wall: theme posters. Right: final presentation and demonstration of use of the E-post-it.

3. RESULTS

First, we present the ideas of the designers. We then answer the research questions. We use Suchman's (2007) concepts of intra-action, ordering devices, the interface and outside/inside to inform our analysis. Not every one of the concepts is relevant to every question. We refer to the concepts where relevant.

3.1. THE DESIGNERS' IDEAS

This section presents the ideas worked out by the designers in the second of the two sessions, after the user data had been presented, and they had had time to work on their ideas.

Designer 1 proposed an 'ePost-it' (Fig. 5). Objects in the home, particularly pieces of paper that needed to be processed (such as bills), could be tagged by a user using RFID. With an RFID reader the user could later walk around the home and the tagged objects can be found again. **Designer 2** designed a 'fly-curtain' for the hallway of a home. Things to be remembered could be attached to individual strings that would automatically unroll gradually. Things overdue would come to lie on the floor, so one could kick them away.

(Fig. 6). **Designer 3** made a wristband of 'magic slate' material (Fig. 7), so that writing reminders and then removing them again could be a fun, playful activity: the 'time-bandit'.

Figure 5: piles of paper as inspiration for an E-postit idea. Designer 1 engaged with the problem shown in the research data of papers piling up in the house, and related it to his own life.
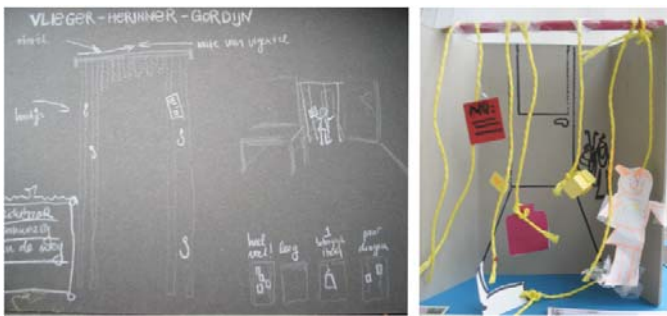

Figure 6: the "fly-curtain": Designer 2's first idea and the final model: a curtain made of long strings, to attach items to be remembered when passing through the curtain on the way out. The photo on the right shows a functional scale model made in the second workshop, with personalised strings.
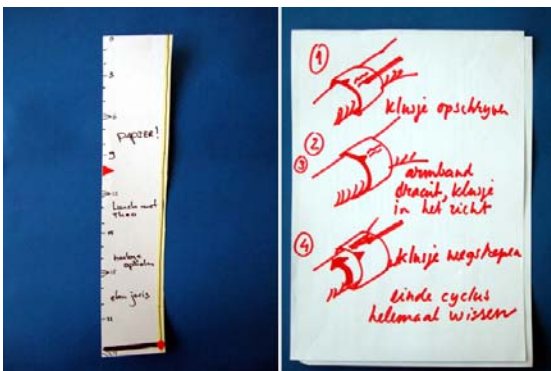

Figure 7: "time-bandit". Designer 3's final model and its scenario of use: writing a reminder on it, the wristband turning to display the reminder at the appropriate time, and removing the reminder with the pen.

3.2. HOW EXACTLY DO DESIGNERS USE INFORMATION ABOUT PRODUCT USE?

The designers incorporated the data that was presented to varying degrees. Two took their own situation as point of departure, augmenting it with information from the data. One of them transferred her initial idea

completely to a family situation. None of the designers began by describing the activities of users in their homes explicitly. In that, the designers did not in the first instance seem to think in an intra-action oriented way. However, their verbal descriptions and acting-out of their design proposals showed that they were attentive to (presumed) actions of users.

Designer 1: his implicit frame was that of a person who primarily wanted to rid themselves of chores. In this he drew on his own situation as well as that of one user represented in the data. No structure was imposed on the routines of the home to make them more manageable, or to keep up appearances. Rather, the advantages of digital media were exploited to address sedimentation of documents in the house with minimal adjustment of preferred habits. This designer's proposal would allow people to still have the substantial advantages of paper over other media such as easy and free-to-choose storing, stacking, displaying, and writing-on. The proposal would add the possibilities of digital media: detection of localised signals, and notification of deadlines that could be activated at one's convenience. The designer suggested that the proposal could also be used in a household to help someone else to trace their things, or it could be used by a company to help people meet deadlines, such as bills to be paid. The proposal places control in the hands of the user, to be used at leisure.

Designer 2 took the most head-on attitude. She converted the 'ordering devices' she had identified from the data, such as the pressure of things crowding in on one's freedom, presenting the home to visitors, and the necessity to prioritise to-do's, into conspicuous visual and tactile design expressions. She drew these aspects together into a focal object that asserts its presence and demands that encounters with it should be consciously undergone. She projected her proposal onto a family with children, adapting it to their various needs. Her proposal was an object that would interact with people on its own terms, displaying its action possibilities clearly and attractively. Members of a family could use it to display their to-do's to each other, possibly to develop playful ways to interact with the object and each other. In terms of interface, she created a veritable counterpart to human actions which would react to and reflect people's lives. Her proposal is highly intra-active in that it continually provokes interactions with it, demanding generative acts from its users. It does not, however, control those acts and is even prepared to retreat entirely at a snip.

Designer 3: this designer's proposal sought to give its owner control over the problem of managing tasks over the span of a day. It aimed to make a very detailed and time-linked planning of the day possible. It sought to transfer this designer's own habit of calmly detailing to-dos by accumulating them in writing, in a spot one could always keep an eye on, to a mobile solution. That way, keeping control of time and task planning could more seamlessly connect the calm moment at home to the activities of the day. The designer's proposal individualised time- and task-keeping. Having encountered the data of family situations,

he argued that his proposal would give each person in a household responsibility for their own time. The proposal gives users individual control but also exerts a control over its users in a way that is invisible to others. The proposal was directed towards presenting a necessity (of remembering tasks during the day) in the guise of an 'object of desire'. In that, this designer showed clear awareness of ordering devices such as stigmatization. He sought to make events occurring during the day controllable as well as the appearance of the user of the design proposal. He designed a gadget in which the actions of recording and reading reminders are given a playful character through a kind of 'magic slate' interface. This motivation in the designer's proposal was not so much based on the user data as the designer's own interests. His proposal had the strongest element out of the three of representing the user of the design in a particular way – as someone in control of his or her time.

3.3. DO DESIGNERS SELECT THE MOST USEFUL KIND OF INFORMATION TO WORK WITH (GIVEN LITTLE TIME)?

According to Suchman, designers should search for practical, critical and generative acts of engagement of users in their situation of use. Did the designers do this?

The designers found themselves somewhat overwhelmed by the data presentation. This was not because there was too much of it. Rather, they felt that they needed to have a more active role in structuring the data to inform design. The transition from user research data to the formulation of a design goal was not seamless for the designers. In a retrospective reflection on the session, one of them stated that he would have liked to have more involvement in the generation of themes from the data, in order to be able to absorb them better.

The designers experienced the form of the data that was made available to them as a limitation they would have liked to overcome. To do so, they made use of the availability of the researchers for conversation about the users. The researchers could fill in details about the users and could also confirm or adjust tentative interpretations of the data that the designers made. The time frame for the sessions was quite tight, of course. None of the designers undertook any further actions of their own to overcome the limitation of the data presentation. This is often the case in commercial design situations, too. Time constraints overrule requests for a closer involvement with a context of use.

In the reflection on the sessions, the designers stated that they appreciated having been given the opportunity to begin by designing from their own situation. This, it seems, already gave them a starting point from which to connect themselves as users to their design proposals. Reflection on their own situation,

and comparison with the situation of other users, was a recurring theme throughout both sessions. The designers used the three day interval between the sessions to reflect on their proposals and their possible use. But they undertook no activities to model their ideas into their own real-life situation.

In presenting their designs in both sessions, the designers tended to take more of an artifact-centred perspective than a person-centred perspective. The action potentials of the artifact itself played a larger role than the work of people using it. The role of people as potential producers of artifacts, was even smaller. Even though their perspective was artifact-centred, the designers included many interaction-related aspects already in their first idea presentations, at a point where they had not yet seen any data. In their verbal presentations, the designers' proposals tended towards giving control to the artifacts rather than to the users. None of the designers sought or presented information on how their design proposals might come into the lives of users and be incorporated by users into their lives.

The designers did, however, show a keen understanding from the first session onwards of the behaviour of *things*. All of the designers' ideas in the first session already addressed the following interaction-related aspects: prioritisation, sedimentation, passivity or activeness, noticeability, fixed or variable placing, and aesthetic and emotional character of the visual reminder. Perhaps what was missing for the designers was a vocabulary or set of concepts to first describe user activities before the activities of things.

3.4. HOW EXACTLY DO DESIGNERS DESIGN EMPATHICALLY?

The designers used several techniques to draw themselves closer to the activities of users: they aligned their own ideas from the first session, and their reflections on how these related to their own lives, with arguments and statements given by users in the data. In the designers' presentations, they acted out actions that they thought would be connected to their design proposals. They sought to bring the users' expected engagement with their proposals to life. One of the designers 'adopted' the data by decorating herself with the cards with statements. She also created a persona that moved around in a small-size model of her design proposal.

Designer 1, with the 'ePost-it', made reference to the fact that some people are more organised than others - and proposed a design for the latter category. "Some people tidy it away, others make a mess of it, leaving it on the kitchen worktop. The problem is that of always postponing." So his design focused on the moment at which the problem begins - the moment of opening an envelope. The idea was to tag things at that moment with a priority and a time span, so that they could then be put away. His design paid no attention to 'ordering devices' in terms of presenting a tidy home. The only concession to the users' achievement of

rational accountability was to help the users deal with necessities such as the paying of bills in the least bothersome way possible. In developing this design, this designer stayed closely oriented on his own situation and interests, selecting information from those users who were in line with his own preferences. One could say he acted as a 'solidary' designer. He showed his design by demonstrating the actions 'on' himself, with makeshift props representing the designs.

Designer 2, 'fly-curtain': she designed the object to actively support people in presenting appropriate appearances. The object would get itself out of the way briefly to allow people to present a tidy home to their guests and create an open, welcoming hall. It would do this by 'retreating' briefly each time the front door was opened. But it would then come back down to be a conspicuous reminder again, playfully challenging the notion of a tidy house. And, likewise, to let the visitors see that this household's life is like this. So this proposal was attentive to the social norms held by people, and proposed a way the product would respond. One might say that she chose a 'dialectic' approach, acknowledging the clash between presenting appearances and managing daily life, particularly where this applied to a family group of people. She visualised this clash in a playful way. She had realised that a family situation was rather different than her own life situation, so she 'transferred' herself into the situation she designed for by creating it in a model and acting out interactions 'in it'.

Designer 3, 'time-bandit': took a different tack in dealing with the issue of presenting a tidy hallway. He argued that research participants had said to already feel ill at ease with just keys, mobile phone and a letter lying on a table in the hall. And likewise, that managing a family could not be done 'centrally'. Hence his idea of individual wristbands in combination with a time keeper. The wristband could be given gadget quality, countering the possibly stigmatising air of necessity with conspicuous styling. One might say that his approach was a 'conformist' one. It was mainly focused on an individual conforming to the way things should be, and being in control of that. Even the risk of being compromised because other family members might not cooperate was neutralised by individualising the time-keeping. In a sense, his design proposal tries to prevent unforeseen events from disrupting a carefully planned day. This designer's proposal went rather far in seeking to provide a user with control of a situation. This raises the question whether the proposal would also enable the user to hold on to this control in the face of exigencies of events. This designer too presented his design by acting out its possible use.

3.5. WHAT IS THE ROLE OF KNOWLEDGE ABOUT PRODUCT USE IN IN-PROCESS EVALUATIONS?

Only a few observations regarding in-process evaluations could be made. The case that we have presented, was a fairly brief and artificial design situation, in which the issues involved never reached a critical situation. This would be the case, for example, when serious problems occur in the use of a product. This study did not go that far. In the sessions, we provided a 'frame' to suggest an Outside and an Inside, by telling the designers that the task was set by an unnamed client seeking designs that were particularly interesting in use. With this, we intended to provide constraints other than product use for the designers to focus on. This point was not taken up by them very much. When asked to choose one final best concept to present to the client, they chose to present all three. This suggests that the research design did not pressure the designers enough to evaluate their designs critically.

Another observation relating to in-process evaluation was about multiple users, for example with several people in a household. The issue already came up in the first session, before any user data had been presented to the designers. At this point the designers noticed that they had initially only thought about the topic from the vantage point of their own situation as single people. One of them, Designer 2, then immediately adopted this new situation, reviewing her design in the light of the new insight. The other two were less explicit in incorporating the new perspective. It remained a sub-topic for them throughout. Designer 1 had studied the data, but found himself formulating his own set of requirements for his design, without comparing how these fitted with the data. Only later did he think to compare again whether his design would be useful in terms of the data. So the availability and periodic reconsideration of user data seems to be an issue for in-process evaluation.

4. CONCLUSIONS

How do the designers use information about product use?

- They connected it to their own lives

- They did not start from the activities of users. Still, they were attentive to the presumed actions of users with the design proposal and how these actions are connected to objects.

- Two of the designers stuck closely to their own situation. One employed special techniques to 'enter' a situation different from her own.

- Two designers presented proposals that engage with the users' activities playfully. One presented a proposal more oriented on control and keeping up appearances.

In conclusion, there may be a lack of ways to represent the *activities* of users in a way that is useful for designers. These activities are not sufficiently expressed in e.g. personas, photographs or quotes from users. The activities should be presented in a more activity-related way. Designer 2 moved some way towards this. By quickly modelling the use situation in a small-scale mock-up, she found a representation for the activities of users who were very different from her own life situation. The user data in this study did not present a very in-depth picture of user actions. It is surely worth exploring how that could be achieved.

Do designers select useful information?

This seemed rather strongly influenced by the data presentation. It turned out that it was not so much the designers' search as the available data that was the limitation. The cards quickly turned out to be too limited. In spite of only short time being available, the designers felt it necessary to sort the data for themselves, rather than having to understand pre-mediated abstractions (themes) provided by the researchers. A conclusion would be that in a design situation, there needs to be flexibility in the way the data is presented. Possibly the narrative flexibility of a researcher cannot be replaced completely by other tools. Another observation was that the designers were overly focused on the behaviour of things as opposed to the activities of people.

How exactly do the designers design empathically?

The three designers showed different styles of designing empathically. Their styles seemed to reflect each designer's personality, particularly in the way they envisaged their products' interactions with their users. A conclusion from this may be that product buyers should also be able to learn something about the designer's (or manufacturer's) personality in order to be able to judge whether the product will *behave* in a way that suits them. This, of course, is branding. But branding does not usually include statements about the products' style of behaviour towards the user. Maybe it could do so: a kind of interaction branding.

What is the role of knowledge about use in in-process evaluation?

Unfortunately not a lot could be gained from this research on this question. This is probably due to the artificiality of the design situation. A challenge for future research will be how the findings from this research can be operationalised for design situations. In order to gain more knowledge on in-process evaluations, a more realistic design situation should be studied as well.

Finally, to look back on Suchman's challenge that designers should take responsibility for their role In mediating product use: the designers we invited were probably quite reflective designers as they are all also researchers. Nonetheless, we found several aspects in their process that limited their optimal use of

information about product use. These lay, for example, in the presentation of the data, but also in the designers' attitude to the activities of product use. There are, then, design-process-related aspects that can be worked on in order to enhance the role of knowledge about product use in the design process.

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