Probing – Two Perspectives to Participation

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Abstract Practitioners from different fields of design and research apply the 'Probing' method as means of getting a better understanding of their users and to inspire their designs. During the 15 years since its first appearance, the probing method has been extended for deployment in different contexts and for different uses. In this chapter we first briefly introduce what probes are about, then we look at probing from two perspectives: (a) as a process of collaborative discovery and learning, and (b) as a tool for entering the users' contexts. We illustrate these perspectives through cases in which probes have been introduced in educational and professional environments. Based on the findings, we discuss how a making process of probes can engage a design research team to the issues of concern, and present a set of problems and challenges encountered while probing professional work. Finally, we propose a set of considerations for designing probes for different purposes.

Introduction

Human computer interaction (HCI) and user-centered design (UCD) practitioners apply experimental methods such as probes as means of understanding genuine experiences of users and inspiring design. There are variations in the applications of probes but in general they are based on (a) user participation by means of self-documentation (b) for studying user's personal context and perceptions (c) by applying exploratory mindsets and materials (Mattelmäki 2006). In this chapter we

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P. Markopoulos et al. (eds.), *Collaboration in Creative Design*,
DOI 10.1007/978-3-319-29155-0_3

will first give an introduction to probing, and secondly, deepen the understanding of the approach by considering it as a process of collaborative exploration and learning, and as a tool to enter the users' world. Finally we will end by listing key considerations for the application.

Gaver et al. (1999) first introduced Cultural Probes as a form of exploratory and design-oriented self-documentation method. Cultural probes are collections of evocative tasks meant to elicit inspirational responses from people – not comprehensive information about them, but fragmentary clues about their lives and thoughts (Gaver et al. 2004). Cultural probes were purposefully against scientism, open-ended, and designer-centered when approaching users: *"these packages of maps, postcards, and other materials were designed to provoke inspirational responses from elderly people in diverse communities. Like astronomic or surgical probes, we left them behind where we had gone and waited for them to return fragmentary data over time."* (Gaver et al. 1999, p. 22). An aesthetically well-designed probe kit is given to volunteers, who then complete the assignments and send them back to the researchers. The contents of the probe kit differ from one design or research project to another, but the assignments and materials typically are purposefully ambiguous, trying to stimulate the mind of the participants and capture their experiences.

Since the original probes, the development has been active as researchers and practitioners in the design community have extended probes for different contexts and uses, including Technology probes (Hutchinson et al. 2003), Mobile probes (Hulkko et al. 2004), Empathy probes (Mattelmäki and Battarbee 2002), Urban probes (Paulos and Jenkins 2005), and Design probes (Mattelmäki 2006), just to name a few.

Since the Cultural Probes were introduced 15 years ago the probes method has become a phenomenon, as stated by Wallace et al. (2013). It has been studied and discussed in research literature widely. In their excellent review on probes uses in HCI, Boehner et al. (2007) already counted 90 papers citing the use of probes in the ACM guide to computing literature. Despite the fact that Bill Gaver and his colleagues have been critical on the misinterpreted applications of the experimental method, both researchers and practitioners continue probing in various ways and for a number of reasons. One might say that it is not a specific method per se but rather a family of approaches that have been influenced by the Cultural Probes. Some of the probes approaches have a closer relationship to the original one, however, as identified also by Boehner et al. (2007), probes have quite often been reported as a data collection method similar to questionnaires.

Gaver et al.'s (1999) Cultural probes was done for inspiration and information. Based on empirical data and literature Mattelmäki (2005) later identified four reasons for using design probes in product development and concept design context: (1) the probes data and the whole process of probing can fuel design inspiration, (2) at best probes also provide useful information about users' context and needs, (3) they allow participation by including tools to reflect and express participants' needs and ideas, and to participate in design, and (4) they foster empathy and dialogues between participants and researchers/designers, and moreover within design teams.

Later, to stress the collaborative and exploratory nature of the probing process, she elaborated the reasons for probing as follows (referring to Brandt's (2006) work with Exploratory Design Games):

- *"To support creative thinking, to explore novel or unconventional perspectives and to inspire designers and other stakeholders;*
- *To engage and empower various participants in an exploratory design process, to reflect and create new ideas based on their experiences and insights;*
- *To ease the social collaboration in multidisciplinary teams and with users;*
- *To involve collaborative people and organizations in human-centered design dialogues. These dialogues are part of developing the understanding of the users, making sense of the design space and its opportunities and supporting the exchange of information and learning in collaborative teams;*
- *To enter the individual zones of the people that are studied. Probes aim to foster subjective and empathic insights into the other participants as well, be they designers or other collaborative experts"* (Mattelmäki 2008; 67).

Following the same mode of thinking Wallace et al. (2013) give a rather open-ended definition for probes as tools for design and understanding to be used as empathic engagement with participants in the search of what is personally meaningful.

What Is Probing?

Although the probing approach escapes from one definition or an agreed procedure, we may still talk about the *how of probing* based on an essential structure and practices commonly found in precedents, in order to provide an entry point for beginners.

Probing is typically applied in the early phases of the design process where the questions and the design directions are explored. Mattelmäki (2006) has identified five steps in the probing process:

1. Tuning in to the topic, i.e., designers and researchers collaboratively explore the experiential elements of the topic, and plan and design the probes kits and the assignments.
2. Probing by users, i.e., self-documentation and reflection of the experiences at the users' context.
3. First interpretations by designers and researchers, i.e., the returned probes are studied for further questions.
4. Deepening together by users and designers, i.e., follow-up of the probe materials in an interview with the users.
5. Interpretations and outcomes, i.e., the researchers and designers collaboratively make sense and create interpretations of the probes. The process results in empathic understanding and descriptions of the users, their contexts and the phenomena that are explored, design ideas or clarified directions, and further questions.

The original Cultural probes process consisted of three steps, namely 1, 2 and 5, as it aimed at design imaginations based on the returned probes, rather than valid understanding of user needs (Gaver et al. 1999). For user-centered design projects whose aim is mostly to reach a valid understanding of users' world, the authors recommend considering the 5-step process.

A probes kit can be a combination of a number of assignments that allow written and visual expressions. The assignments both document the current situation, e.g., in diaries, with open questions and by taking photographs, and trigger thinking of potential future experiences, e.g., by open questions, visual collage or mapping tasks or even some form of early design ideas.

It is worth noting that the probing process and kits are in principle meant to be designed and redesigned specifically for each project. The open-ended nature of the probes supports that and the design of the probes per se is an important part of the probing process. For this reason, probes purposefully avoid to pin down a unique procedure. The authors of Cultural Probes and several followers underline ambiguity and open-ended interpretation, rather than rigid guidelines in the application.

Building on these notions, in this chapter we look at probing from two perspectives in order to further elaborate the exploratory, reflective and collaborative process of probing.

First, we consider probing as a process of collaborative discovery and learning. This perspective mainly looks at probing from the designers' or researchers' point of view. It also focuses on benefits in the process of method-making, i.e., the collaborative exploration and empathic design process that starts already when the design team starts to consider what are the probing instruments and what are the questions to ask (Lee 2014). Mattelmäki (2008) calls this phase *"tuning in for co-exploring"*. This part also addresses the materiality of the probes engagement including the character and design of the probes tasks (see also Wallace et al. 2013). To illustrate this perspective we present an example case in which design students reflect their experiences while probing.

Second, we consider probes as a tool for entering users' contexts. This perspective focuses on the participants' view and emphasizes in line with Wallace et al. (2013; 3) that *"probes need to work hard to facilitate a participant's reflection, deploying a range of multi-angled methods"*. The success of the probing requires that the participants invest their time and thoughts when working with the probes. Furthermore, users' active role in the design process has been stressed by, for example, Liz Sanders (2001) who envisions that designers should be engaged in building scaffoldings that support everyday people's generative design thinking. Probes as a tool can offer such scaffolding.

However, we have identified problems of probing in professional contexts and based on examples provide a set of considerations for designing probes that are at the same time pleasurable and easy (e.g., Lucero and Mattelmäki 2007). To illustrate and provide a context for the discussion on the proposed considerations, we present how probes were applied in professional environments, including a study with industrial designers and other studies in which probes have been applied. Our

findings suggest that the main challenges researchers will face when designing probes, especially for professional contexts, include aspects related to (1) reducing the demands placed on participants, (2) encouraging a fluent and playful process for participants to avoid 'obligation', (3) being sensitive to the special nature of the work that is being studied, (4) supporting different strategies for using the materials, and (5) motivating the participants. In the following, we will introduce these two perspectives with examples and end the chapter with an outline of considerations on how to make probes work in practice.

Probing as a Process of Collaborative Discovery and Learning

Like many other user research methods in design, the design of probes requires careful considerations to *make the probes work* (Lucero et al. 2007). Probes, as a self-documentation method, needs to communicate to, inspire and engage the user participants during the probing process almost on its own, going beyond designers' or researchers' control. As the probes often aim to trigger participants' reflection and imagination, the triggering mechanism should be carefully designed. Probing tasks often involve designerly activities, such as drawing, visual collaging, photographing, or low-fidelity modeling, to help users reflect on their own experiences and express them through various means.

Because of these reasons, the design of probes tasks and packages often involve designers' hands-on making. In principle, this making needs to be done in each application case in order to fit in the idiosyncratic context of the project. This nature of the probes is precisely what Bill Gaver and his colleagues have aimed to highlight:

> Just as machine-addressed letters seem more pushy than friendly, however, so might a generic approach to the probes produce materials that seem insincere, like official forms with a veneer of marketing. The real strength of the method was that we had designed and produced the materials specifically for this project, for those people, and for their environments (Gaver et al. 2004, p.29).

Some may view the making-phase of the probes time- and resource-consuming, or as *extra effort*, which could have been minimized by pinning it down to the standardized form of the probes. However, in terms of the essential aim of the probes, i.e. allowing open interpretation in users' own context and enabling personal dialogues and empathic engagement between designers and users, the idea of pinning down the process could conflict with what the probes is actually for and can do. In fact, the making phase of probes brings benefits to the design team, going beyond being more relevant when users fill it in. Recent studies have highlighted that the design team could build empathic engagement to the user context and sensitivity to the users already when making the probes (c.f. Lee 2014; Mattelmäki 2008; Wallace et al. 2013). They address the design team's collaborative learning from the making of the probes in following aspects:

- First, the design team's exploration into communication methods and materials of the probes sensitize the team with the topic and helps them build empathic mindset to users.
- Second, visual and tangible construction of the probes allow externalization of designers' inner hypothesis, thus leading them to early exploration of possible design space.
- Third, the design team's collaborative discussions and decision-making during the probes-making allow the team to have a shared understanding of the probes aim and the users.

Lee (2014) has discussed the above-mentioned effects of the probes-making from the students' case. She analyzed 50 students' learning diaries written during the one project course from master's program of Industrial and Strategic Design in Aalto University for 2 years (25 students each year). In that course called *User-Inspired Design*, the students learned empathic design approaches for collaborating with users and exploring future design opportunities, beyond the scope of traditional user-centered design.

During the 9-week course, the students worked in a group and went through a comprehensive concept design process by using various empathic and collaborative design methods. One of the often-used methods was probes. Each week during the course period, the individual students wrote the learning diary, reporting and reflecting on the challenges, activities and accomplishments during the project. The diaries contained lively stories about challenges that the students encountered, how they organized their actions to the challenges, and how they tried to make the probes work – those are *behind-scene stories* which we seldom find from academic papers or handbooks of the method. Thus the diaries exhibited what kind of situated work the probes-making entailed and what learning was going on during that work.

Stepping into Users' Shoes for Making the Probes Work

Designing the relevant tasks for probing was the students' major concern. The *aesthetics* (i.e., look and feel) and *usability* of the probes required huge efforts. The aesthetics and usability of the probes were important criteria for the students to motivate the users' participation in the probes.

> *We designed buttons that they can attach to the bag [a bag for the probes package]. It might not be related to our research directly, but we made it for motivating teenagers [with a] jolly-looking kit. We had such heated debates within our team to decide the colors, too. The teenage girls would like vivid colors but boys would not, and so on. It was interesting to hold such debates, imagining the teenagers' feelings and preferences while doing our probes.* (A quote from one student for the project on designing for teenagers' peer-to-peer activities)

The students' diary stories showed that the work for probes-making, for example, holding discussions on what colors the teenagers would like and making bags and badges as the probes components, kept the team discussion oriented towards topics

of what the teenagers would prefer and what they would be like. The students also discussed what time of the day the teenagers would keep the probe diary, how they would carry the probe kits with them and so on. This kind of practical work for making the probes gradually engaged the students in the users' situations by talking about the users and simulating user experiences, for example, simulating what the users would feel when they touch the probes materials and answer the probes questions.

> *First of all, I realized how important it is to concern our target users over the whole process of user research. Of course it sounds so self-evident, but it also means that we should carefully consider them when we make the materials, such as diary or social map, for the probes. Which font size is enough for our users to read? What kind of language is more understandable for them? We should really consider characteristics of our users to get the right results.* (A quote from the student for the project on enhancing social interactions of elderly people)

Considering font sizes or colors might be a peripheral issue. Yet, by orienting the design team's actions towards such peripheral, physical details, the design team could become more and more sensitive to the users and their contexts, and build emotional engagement with them. This observation is in line with Hemmings et al. (2002) observations on Gaver's team when designing the Domestic Probes. They discovered that in the early phases of the project talking played a central role. Through discussions the team shared their knowledge of design issues, reached an understanding of the probes' qualities, and, as reported by Hemmings et al. (2002; 45), "spent a lot of time arguing and joking, made up stories, made sketches, kept notes, and talked over previous and possible scenarios".

Knowing the Designer's Own Assumptions Through Probe-Making

The probes-making process could enable the design team to realize their own assumptions to the user groups and preoccupations to the topics by making them externalized. In another example from the students' diaries, one student team aimed to design a service in the outskirts of Helsinki that could support elderly people to be more active and visible in the local society. The students wanted to apply the probes in order to understand elderly people's past memories, emotional experiences, daily activities and wishes. Initially this student team had the idea of a daily probe tasks, which would be delivered to the elderly people on a daily basis. A different probing task delivered each day was the students' tactic to make the whole process exciting and fun for the elderly participants.

The student team visited one community facility where the elders spend their time together, and tried to recruit the participants for their probes study. Soon the students realized that their daily probes idea would not work out. Different from the students' expectations, the participants' daily schedules were too busy to meet the students everyday.

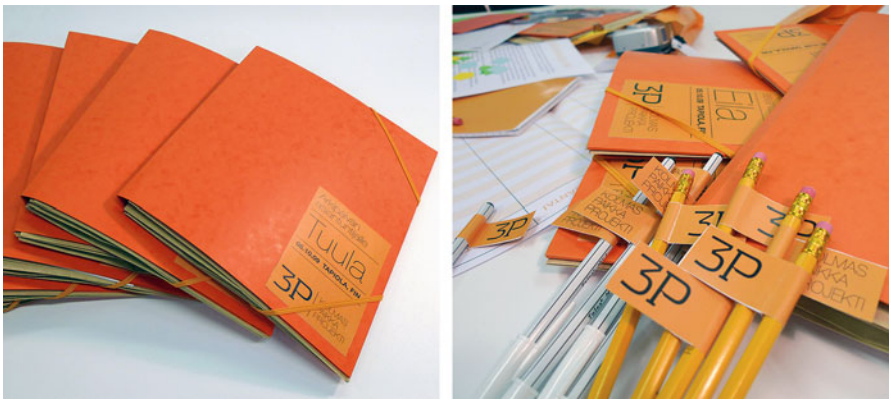

Fig. 1 Re-designed probes for elders: This student group included separate envelopes inside the folder to be opened on daily basis (*Left*). This group personalized each probes kits by placing each participant's names on the package. They also placed their design team's identity (3P as a group name) in the probes packages so that it can create feeling of dialogic, personal communication (*Photo courtesy: Sam Dunne, Jari-Pekka Kola, Joanne Lin, Otto Miettinen, Milla Toukkari*)

> *In our own study, we had already thought a lot about the probes tasks before we met our users for the first time . . . It became obvious that we needed to adjust the tasks we had planned for the probe kit to better suit their [the participants'] preferences. In particular, the elderly ladies were afraid of having to use [too] much of their time for the probes. Contradicting to our stereotypical thinking, they [the elderly participants] were extremely busy!* (A quote from the student' diary)

In this story, their realization on 'busy elderly people' not only led them to redesign their probe package (they re-designed the probe package that contained the daily tasks in different sealed envelopes so that the elders could open one each day) (Fig. 1), but also to reframe the whole direction of the design opportunities. After noticing the elderly people's busy schedules, the student team reframed their project aim, from 'how to activate the elderly people's life' to 'how to cultivate on this active elderly group to spread their spirit to the society' (Fig. 2).

In this story, the making process of the probes enabled the student team to see a truer picture of the users. The sequence of actions in the making of the probes made the students' own assumptions and intentions more tangible so that the students themselves could recognize them. Just as ethnographers conduct auto-ethnography for externalizing their own assumptions for writing about others (Ellis 2004), the process of the visual and tangible creation of the probes could help designers understand their own assumptions to the users before interpreting the probes results and generating design ideas.

The students' cases above imply that the process of making the probes, including iterative hands-on making of the probes package, group discussions and decision-makings on the choices for the probes components and so on, improved not only the relevance and efficacy of the probes itself, but also the students' understanding of what actually matters to users. The local sensitivity and contextual knowledge

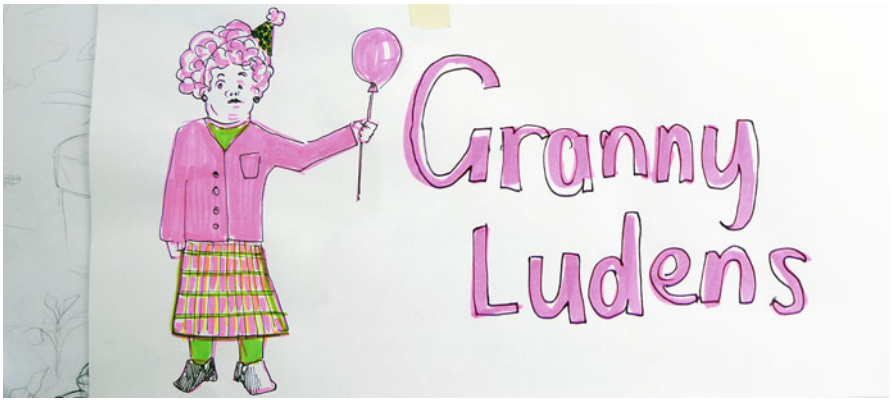

Fig. 2 Student's drawing on their re-conceptualization of elders after the probe-making. They reframed the characteristics of their target group from passive elders to active elders who enjoy their life, *Granny Ludens*, inspired by Homo Ludens (*Photo courtesy: Sam Dunne, Jari-Pekka Kola, Joanne Lin, Otto Miettinen, Milla Toukkari*)

developed through making the probes led the team to identify meaningful design opportunities, as illustrated in the case of the students who changed their design aim from activating passive elderly people to facilitating active elders to influence their community.

These observations lead us to consider the making process of the probes as the externalization and manifestation of designers' tentative hypothesis of users and future design opportunities. This notion is in line with what Wallace et al. (2013) talked about the probe designs as "forms of tentative hypothesis towards empathic understanding and also future design ideas that are informed by aspects of particular contexts we have hunches about." In this sense, probes-making can be understood as a form of articulated introspection into what the designer already knows, through iterative externalization of what the designer wants to know in relation to an instrumental goal. In itself, the making process of the probes carries values and benefits for design, enabling the design to understand users and speculate possible design solutions.

Probes as a Tool for Entering the User's Context

Most published probes studies have been carried out in domestic contexts. There are, however, cases in which probes have also been experimented to study work contexts such as nurses and clinical collaboration at hospitals (Jääskö and Mattelmäki 2003), e-work (in which the domestic and the working context become blurred), and ageing workers' well being (Mattelmäki 2006). Our experience while applying probes both in domestic and professional environments indicates that applying the probes

approach at work has special characteristics that have not been formally addressed. For example, introducing probes in the work place can have a negative effect due to interruptions to the work of the participants. Answering questions on a diary can be a significant distraction from the participant's main task. Participants can be reluctant to take part in these studies (Carter and Mankoff 2005).

With professional probes, Lucero and Mattelmäki (2007) looked at the use of probing in professional contexts. Using a case study with industrial designers as a basis for the discussion, they also drew on other projects to further illustrate their findings. The 'Augmenting Mood Boards' case (Lucero and Martens 2006; Lucero 2009) was a project that studied the impact of augmented reality systems in work practice. The project tried to assess whether professional users would change their current work practices favoring the use of augmented reality tools that provide support for their work. Probes were applied to open a dialog with professional users (i.e., industrial designers) and find opportunities for augmented reality interaction techniques to support their work.

Seventeen practicing industrial designers were recruited for this study. They all initially agreed to participate in the study although ultimately only ten worked on the probes and sent them back. The participants varied in their education (university/academy), in age (between 24 and 50), and in gender (six women, four men). A wide variety of contexts were obtained, ranging from an office in a large company, to freelance work performed at home. Participants worked with the probes for seven consecutive days in their design studios and were free to choose the day of the week in which they would start. To increase motivation, all participants were given the probe kit during a personal meeting. All participants signed a consent form in which their anonymity was guaranteed.

The materials included in the kits probed different aspects of the life and design practice of an industrial designer. We describe the probe kit (Fig. 3) using Mattelmäki's properties of probe objects (Mattelmäki 2006). First, the kit included

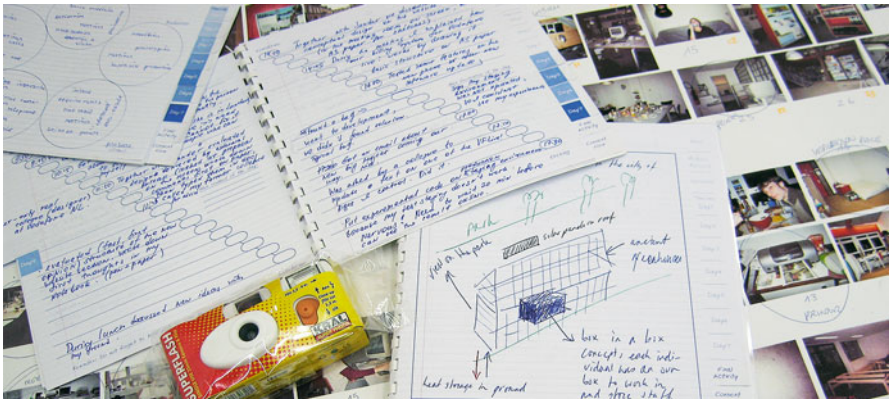

Fig. 3 The industrial designers' probe kit including a diary, a disposable camera, and some of the 200 pictures that participants made during the study

a 'Design Studio' diary that allowed probing several aspects. The diary included (1) a 'Timeline' to probe the daily thoughts and activities of the participants, (2) closed questions covering different aspects of routines, collaboration, and use of technology, (3) open questions to make people tell stories and express their opinions, (4) a map to allow self-expression, and (5) an 'Ideal Design Studio' drawing exercise to probe the dreams and aspirations of industrial designers. Second, the kit included a disposable camera to probe the environment and take pictures to visually support some of the experiences they had while working on the probes. Instead of suggesting pictures on the camera itself by re-packaging it, a 'Picture Record Table' was included in the diary where participants kept track of their pictures. Some suggestions for shots were made but half of the pictures were intentionally left unassigned so they could share different aspects of their environment or activities. In total, participants made over 200 pictures with the disposable cameras. Half of the participants personally returned the probe while the other half sent their probes by mail in the self-addressed and stamped envelopes included in the kit.

The findings from the probe study concerning the designers' way of working are reported elsewhere (Lucero 2009). We will now present the main findings in relation to the challenges of applying professional probes. To guide the discussion we use the previously described probes study with industrial designers. We also provide some illustrative examples from other projects, some of which the authors have directly been involved in.

High Demands on the Participants

Several participants dropped the study after they had initially agreed to participate. There were different reasons for not completing the study although lack of time was often mentioned. However, the energy and time demanded from participants to fill in the diaries proved to be a major problem. One participant summarizes the main difficulties participants encountered with the diaries:

- *"I must say it is a BIG job, much more than I thought. Keeping your diary has a big impact on the way I work, so I wonder if this probe is actually useful."*

Participants indicated the diary should be less time-consuming and should involve less writing. High demands on participants' efforts to complete diaries in the work environment have also been reported by Carter and Mankoff (2005).

The challenge of filling in the diaries in work context has been addressed also in a study about mobile work where participants used camera phones (i.e., mobile probes) as a way to report their experiences (Hulkko et al. 2004). In this case the participants were sent SMSes during the study with tasks for messaging and taking pictures. In another study in which camera phones were used for probing at hospitals (Mattelmäki 2006) the phones had a special probes application. In that study the participants were asked to check daily the tasks from the probes application whenever it was best suited for them. This was thought to be less

intrusive for their work than SMSes arriving at inappropriate moments. However, the feedback from the participants indicates that even opening the probes application for self-reporting required a lot of activeness and remembering. Some of the nurses would have preferred receiving tasks in messages instead. Hence, the balance of activating, interfering and remembering in midst of working is delicate.

Professional probes should aim at low time-consuming activities that reduce the demands on the participants. Alternatives to diaries should be considered. In the study with designers, participants reported taking pictures with the disposable cameras as easier than writing down text. Carter and Mankoff (2005) propose a hybrid between photo and audio capture for studies in which detail is important. Pictures are most appropriate for easy capture and later recognition, while audio is better suited for annotation.

Probing as an Obligation

Several participants from the study with designers reported that filling-in the diary at times felt like an obligation, something they 'had' to do. This created a negative effect making participants often forget about working on the diary:

- *"I think I would be able to give a clearer impression (of my work) in a simpler way if I could use this study as a pleasurable extra, more like a break. The writing gave me the feeling of something that required extra attention."*

When probes become an 'obligation' participants can lose motivation and perceive working with the probes as a cumbersome task (Lucero et al. 2004).

Practical design of the probe kits and diaries can support motivation and reporting at work. The use of stickers and easy-to-access illustrations make diary keeping more playful for users (Mattelmäki 2003). The use of hints such as graphical elements, words and pictures to stimulate associations is recommended. A brief note made on the spot can later trigger deeper reflections in interviews.

Professional probes should encourage a fluent and playful process while documenting the participants' work. The materials should be easily approachable and should avoid the feeling of being an 'obligation'. One of the aims of probing is to sensitize and activate participants to reflect on everyday experiences with fresh perspectives. Thus, the probes should give motivational clues so participants can pay attention to their experiences, and have perhaps even a funny character, a pleasurable extra for work.

Understanding the Specific Work Domain

When planning the probes the nature and context of the work should be considered. In the industrial design study, the placement of the probes was closely looked into.

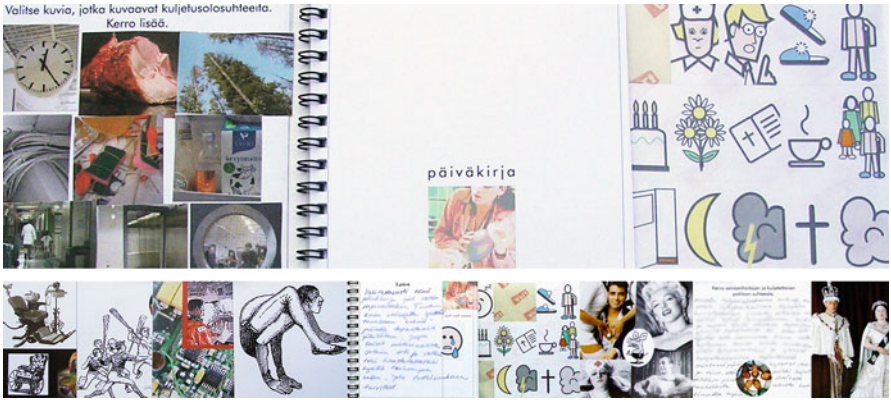

Fig. 4 The nurses' probes including cards and a diary

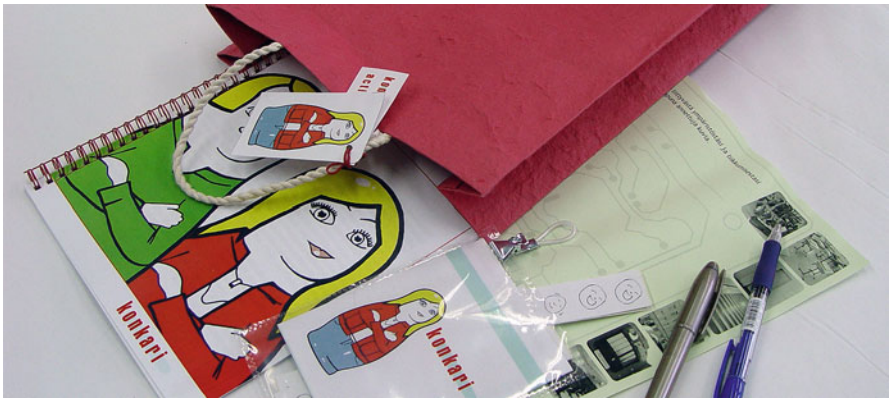

Fig. 5 The ageing workers' probe kit

To create less mess on the sometimes-cluttered desks of designers, most probe materials were concentrated into one booklet. In the study where nurses were involved (Jääskö and Mattelmäki 2003) the diaries were designed to be small and plastic covered to fit the pockets (Fig. 4). In the ageing workers' study (Mattelmäki 2006) the participants mostly worked at schools. Thus, the diaries were in form of school agendas folded into plastic pockets with clips to hold in their clothes or cleaning trolleys (Fig. 5).

The planning of probe tasks for work contexts should consider organizational and management concerns as well. In the industrial designer study, a few participants were concerned about confidentiality issues in relation to their work. This problem was addressed by first reassuring designers, indicating to them that the consent form included in the diaries explicitly considered this aspect. Participants were also free to choose the week in which they would work on the probes if they felt one project was more confidential than another. In the nurses study (Hulkko

et al. 2004) the subjective character of the probes approach and its playfulness, openness and inspirational quality raised management concerns at one of the contacted hospitals. The hospital administrators were thoughtful if the patients' ethical rights were respected and if the self-reporting at work time would risk the quality of the patient care. The grounds for these concerns were legitimate, because during the study we learned that nurses were not able to complete many words in diaries and for taking pictures they had had to make special arrangements such as covering the faces of the patients. However, the probes even when partly completed did spark reflections during work that were later documented or discussed in the interviews.

Another aspect is to carefully consider topics that may be sensible in certain work environments. To study clinical collaboration the participants considered the question "describe a panic situation at work" as highly unprofessional. Panic is not a word to be used in hospital context and in patient care. Thus a provocative wording can influence strong opinions, which are sometimes aimed at, but also negative attitudes to filling-in the probes.

Professional probes should be tuned in to the special nature of the work that is being studied. Aspects of the (1) placement of the probe, (2) management concerns, or (3) the use of provocative wording should be closely looked into to allow the probes to successfully enter the environment they were sent to study.

Different Strategies to Use the Materials

Professional probes can be applied for various purposes. The probe kits, questions and the tasks often vary in each case. The reason why probes are used, the focus and the objective of the study affect how the participants should be supported in using the materials. If the aim is to focus on a specific experience, procedure or activity then the probes should be there reporting on the spot. If one is more interested in participants' characteristics, feelings and considerations, and values, then filling-in a diary is appropriate whenever it feels meaningful to the participant. In the study with designers, participants displayed a rich variety of strategies while working with the diary. Participants either filled-in the diary: (1) as they worked, incorporating the diary as a new task in their normal work, (2) at the end of each task, (3) whenever they would remember, or (4) at the end of the day. Supporting these different strategies had not been initially considered.

Similar aspects have been reported in relation to participants using photos. To document experiences, photos should be taken when these experiences occur to represent the real situation. However, if they are taken later, they can have a hidden story about the lived experience that should be traced in a following interview. As an example, in the nurses' study an anesthesia nurse took a photo of an anesthesia desk to describe 'hurry at an operation.' The researcher was confused with the photo of a piece of furniture trying to interpret the hurry in it. Later in the following interview,

the nurse described that the desk illustrated a dramatic story about a situation about the operation and pointed out some clues invisible for the researcher. The notes in the diary, in which this event was described, what had happened, and how the nurses felt after completed this story. The photo, when explained afterwards, included details that to a nurse represented hurry, which were not evident to a researcher.

Professional probes should be flexible enough to allow and encourage the use of different strategies for participants to work with them.

Participants' Motivation

In the study with designers, a considerable amount of work and resources was destined to create an inspiring probe kit. The booklet itself was designed in a way that designers would hopefully appreciate that it was handcrafted and especially made for them. Upon receiving the materials, designers had very positive comments and reactions. One participant said, *"This is so nice. It really looks and feels like a diary."* The booklet was designed to visually stimulate writing. A handwriting-like font was used to communicate directly to our participants' heart and to trigger an intimate sharing of their experiences while filling-in the diary. A blue color was used for the text to further elicit that it was handwritten with a ballpoint pen. We were successful in conveying this aspect to designers as two participants asked us, *"Did you write this down manually?"* The effort put in designing the probes was rewarded by the participants' dedication to work on the probes. Similar positive comments about the aesthetics and personal touch of the material and their effect on the participants' motivation have been reported also in other studies (Lucero et al. 2004).

In the nurses' study some participants enjoyed that they were asked to study their work from many perspectives. This holistic view was very different from the way company developers normally approach their work. Usually they are asked to evaluate the technology or usability and focus on specific tasks or practices. Some participants said the probe study was valuable because they felt they also learned something new themselves. It is worthwhile indicating however, that in probe studies some participants have been confused and uncertain of the value of the subjective focus, openness and exploring character of probes. This way of approaching research was contrasting with the natural science research methods they were familiar with. For this reason in a study considering clinical collaboration (Mattelmäki 2006), tasks with professional content were added to motivate the participants from the operation theatres. Again, both positive and negative comments on the tasks were heard.

The nurses' probe tasks had visual elements in them and included collage-making assignments. Although there are individual differences how these kind of generative tasks are considered (Mattelmäki 2005), some of the participants had clearly been motivated by them. One of the nurses commented that making the

visual assignments made him think in a new, more visually oriented way, which he appreciated. Two nurses later said that they kept reflecting on the probes' tasks even when the study was completed.

The nurses' probe kits (Fig. 4) included a set of illustrated cards with open questions. One task from the cards was found surprisingly inspiring and successful. The illustration had five characters: Marilyn Monroe, Florence Nightingale, an athlete showing off his muscles, Doctor Ross from an American TV soap opera, and a Finnish male pig cartoon character with individual but creative personality. The nurses were asked, "Do these characters work at your work place?" All of the participants were able to identify their co-workers and created humorous answers describing the social atmosphere at work.

Professional probes should aim at motivating participants by providing inspiring probe materials that are made especially for the study that is being undertaken and by tailoring its contents to the specific work domain. Participants will pay more attention when they feel that the questions and messages included in the probe materials are tailored for them (Fogg 2003). Using the professional jargon of the participants can support creating empathy both for participants and designers. Designing probe kit materials as handmade documents especially prepared for each study has an important effect in supporting the credibility of the material (Mattelmäki and Battarbee 2002).

Considerations for Making the Probes Work

The two probing perspectives to participation presented above help us expand our understanding of what it is like to use the probes in the design process. The first case on students' stories illustrates how the students' work on making the probes could already help them gain empathic mindset to users and sensitivity to user context. The second case on the professional probes shows what considerations should be taken in order to engage the users in the probing process. As the two cases clearly imply, the benefits of the probes for design team's collaborative learning and entering the users' world cannot be simply achieved without the design team's careful considerations and sensitivity. To summarize we suggest the following considerations on *how to make probes work*.

- **Probes should be tuned into the special nature of the participants' context:** Having a casual meeting with the participants before the probe making can greatly improve the contextual fitness of the probes' design. Especially when applying the probes in a specific work context (e.g., professional probes), the probes design should aim at low time-consuming activities that reduce the demands on the participants. Photo and audio capturing should be considered as alternatives to diaries.
- **The design team should pay their attention to new discoveries and group discussions during the making process of the probes:** Designers can gain context knowledge and build tentative design hypothesis through the making

process of the probes, including a casual meeting with the participants, group discussions and material explorations for the probes design. Be aware that this discovery can lead to essential knowledge about users and new design opportunities, even before collecting the probes returns.

- **The probes design can be a reflection of their pre-assumptions and tentative design hypothesis:** The probes questions, types of tasks and material designs are the results of the designers' pre-understanding of the topics and tentative design focus. If the designers do not reflect on how their assumptions directed them to the probes design, they might lose a chance to identify new design opportunities. In other words, making the probes is an opportunity for the designers to realize and reflect on their own assumptions and tentative hypothesis.
- **Probes can provide a 'pleasurable extra' for user's everyday routines, which can trigger their motivations and inspirations:** Probes should encourage a fluent and playful process for participants while documenting. The materials should be easily approachable perhaps even have a funny character to be perceived by participants as a pleasurable extra for their everyday routines or work.
- **Probes should be flexible enough to encourage the use of different strategies for filling in:** The probes design should allow participants to work in ways that are meaningful and relevant at various situations. For example, in professional context, the participants or their management have concerns on the ethics and confidentiality as well as time resources. Flexibility on reporting time and means should be provided to avoid these problems. The means of reporting should be open enough that the participants can frame their answers without risking their privacy. We have suggested that one solution is to allow quick and dirty filling-in strategies, i.e., to note meaningful insights or experiences during the work and to be able to deepen the information and reflections afterwards.
- **The customized design of probes can enhance participants' motivation and commitment:** The customized, handmade probe materials can create impressions to the participants that the probes were made especially for the participants, valuing their participation.

One of the aims with probes is to sensitize participants to the design topic, as well as the experiences and practices that might be relevant for the design. In that way, participants are invited to participate in a co-design process. To facilitate this process, participants can be provided with clues, "things to think with" (Papert 1980) to enable 'designerly' change oriented thinking, to be able to express their needs and dreams with regards to future experiences.

For professional contexts, supporting dialogues to enable design empathy is important too. This can be facilitated with self-made, personal probes kits. When effort is put into the customized research material we expect to motivate the participants to go beyond the official professional roles and to express their personality and their subjective experiences in relation to their work.

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