Tensions in human-centred design

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In human-centred design (HCD), researchers and designers attempt to cooperate with and learn from potential users of the products or services which they are developing. Their goal is to develop products or services that match users' practices, needs and preferences. In this position paper it is argued that HCD practitioners need to deal with two tensions that are inherent in HCD: they need to combine and balance users' knowledge and ideas with their own knowledge and ideas; and they need to combine and balance a concern for understanding current or past practices with a concern for envisioning alternative or future practices. Six HCD approaches – participatory design, ethnography, the lead user approach, contextual design, codesign and empathic design – are discussed in order to argue that these different approaches are different ways to cope with the two tensions. In addition, several examples from practice are provided to illustrate these tensions. Moreover, it is advocated that HCD practitioners critically reflect on their practices, their methods and their own involvement, so that they can more consciously follow specific HCD approaches and more mindfully cope with the two tensions.

Keywords: human-centred design; participatory design; methods; critical; reflection; reflexivity

1. Human-centred design

In human-centred design (HCD), researchers and designers attempt to cooperate with or learn from potential users of the products or services which they are developing. Their goal is to develop products or services that match users' practices, needs and preferences. The term HCD is used here to refer to a range of approaches that share several principles, which are summed up in the ISO 13407 standard (ISO 1999): the active involvement of users for a clear understanding of their behaviour and experiences; the search for an appropriate allocation of functions between people and technology; the organisation of iterations, within a project, of conducting research and generating and evaluating solutions; and the organisation of multi-disciplinary teamwork. My preference for using the term *human*-centred design instead of *user*-centred design – because the former suggests a concern for *people*, whereas the latter suggests a narrower focus on people's roles as *users* – concurs with that of Jordan (2002, p. 12): 'The problem with usability based approaches is that

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they encourage a limited view of the person using the product. This is – by implication if not by intention – dehumanizing.'

This paper focuses on the design of ICT products and services. In that field, there are other approaches, such as human–computer interaction, human-centred informatics[1] or human-centred computing,[2] which have concerns very similar to those of HCD.

Developing products and services that match people's practices, needs and preferences is especially problematic in the ICT industry, in which many innovations are driven by the development of technology. A risk of such a technology-push approach is that products or services are created that people do not want to use or are not able to use. It has been noted that the lack of an adequate understanding of people's needs and preferences is a key factor in the failure of innovations (Cooper 1999, Panne *et al.* 2003). Therefore, businesses and other organisations embrace user involvement approaches in their innovation process.

Recently, guest editors of this journal observed that *not* involving users would currently raise questions: 'Today many companies and researchers question how successful design can be made without exploring people's everyday practices and aspirations and, ultimately, involving the people for whom designs are intended' (Binder *et al.* 2008). In line with this, Kujala (2003), in her review of the benefits and challenges of early user involvement, concluded that: 'User involvement is clearly useful and it has positive effects on both system success and user satisfaction'.

However, several authors have voiced warnings to keep in mind when organising user involvement. For example, Van Kleef *et al.* (2005) argued that people may be unaware of their needs, unable to articulate their needs or unwilling to speak about their needs with an interviewer. Furthermore, Panne *et al.* (2003) argued that designers can become prejudiced about users' needs when they involve them too frequently, and Stewart and Williams (2005) warned against over-emphasising the findings from a small number of users and creating an over-customised product that will interest only a few. In addition, Hekkert and Van Dijk (2001) argued that paying too much attention to what users say may erode the role of the designer, whose vision and creativity are essential for the design process.

Moreover, Kujala (2003), although she advocates user involvement, remarked that: 'Involving users is not an easy task for designers. Early involvement of users appears to be promising, on the condition that user involvement methods are developed further and the roles of users and designers are carefully considered.'

2. Critical reflection

Based on my experiences of working in HCD projects, I would agree that HCD is indeed 'not an easy task'. I sometimes felt like we take our HCD methods for granted or that we follow watered-down versions of these methods. This can happen, for example, if technological or economic concerns threaten to prevail over the concerns for users, or if we fail to take seriously HCD and its principles (see above).

In this position paper, I will explore ways for HCD practitioners to critically reflect on the methods that they use and on their own roles and users' roles. I will advocate reflection and *reflexivity* – understood here as reflection on one's own involvement and role in a HCD project – as ways for HCD practitioners to conduct HCD consciously and mindfully. This advocacy for reflection and reflexivity springs from the idea that HCD practitioners participate – *together* with users and others – in

the process of designing technology – although they do not *own* the process – and therefore have a responsibility to critically reflect on their ways of working and their methods. Such reflection and reflexivity is especially needed, I would argue, when decisions are made in a project. Each project can be conceived of as a series of decisions, in which certain knowledge of certain people is privileged over other knowledge of other people. With each decision, power is exercised and some actors have more agency in the decision-making process than others.

This argument is intended to resonate with the tradition of participatory design (PD), in which people have been concerned with issues such as power and agency and have advocated reflection and reflexivity. For example, Ehn (1993) argued that PD 'raises questions of democracy, power, and control at the workplace. In this sense it is a deeply controversial issue, especially from a management point of view'. Furthermore, Markussen (1994; see also 1996) observed that PD practitioners often do not speak about their own roles and their relation to power, and advocated making themselves accountable concerning the ways in which they 'handle the power delegated to them through the processes of design' and refining 'their reflections on how the relations in cooperative design projects are constituted'. Similarly, Beck (2002; see also 2001) advocated paying attention to the 'societal/political/ethical consequences of ICT development, management, adoption, or use'. Moreover, Bødker (2006) noted that user involvement is often treated as unproblematic, which 'leads to a lack of reflection or reflexivity on behalf of designers as regards their own ways of working'.

There are cases of such critical reflection. For example, the participants in a workshop at the Participatory Design Conference 1998 (Gulliksen *et al.* 1999) discussed topics such as: how to involve users, for example, to let them participate or to let them be represented; how to manage a project and how to facilitate a process; how to deal with conflicts and power; how to take the organisational context and culture into account; and how to organise communication between participants, for example, in order to foster shared understanding or manage expectations.

3. Tensions

This position paper's main argument is that there are two tensions inherent in HCD, which HCD practitioners need to cope with, and that they can cope with these tensions by engaging with critical reflection on their methods and their roles.

HCD practitioners need to combine and balance their own knowledge and ideas with users' knowledge and ideas; they will have to decide when and how, and to what extent, to be *human-centred*. For example, they can decide to talk with users at the start of a project in order to define and steer the project, or they can decide to privilege their own ideas about technical details at the end of a project. Similarly, they need to balance a concern for understanding current or past practices (a research orientation), with a concern for envisioning alternative or future practices (a design orientation). For example, they must decide on ways to study and understand users' current practices, and on ways to explore and envision alternative practices.

The first tension – between project-team members and users – originates from the differences between the world of researchers and designers and the world of users, and the gap between these worlds. 'Each world has its own knowledges and practices; each world has well-defined boundaries. Movement from one world to the

other is known to be difficult' (Muller 2002). HCD is an attempt to bring these worlds together, either by helping researchers and designers to move towards users, or by helping users to move towards researchers and designers.

The second tension – between research and design orientations – occurs because HCD aims both to understand the present and to design for the future (Ehn 1988, Kanstrup and Christiansen 2005). One has to perform 'the juggling act between the [...] role of collecting and analyzing data *versus* the [...] role of initiating and sustaining significant change' (Spinuzzi 2005). This tension was also described by Haddon and Kommonen (2003); they wrote about the differences between a concern for studying and describing current or past situations (typical for research), and a concern for exploring and visualising alternative or future situations (typical for design). This tension can be understood as a tension between a concern for *what is* versus a concern for *what could be*.

4. Different approaches

In order to further explore these tensions, I will discuss six HCD approaches: (1) participatory design; (2) ethnography; (3) the lead user approach; (4) contextual design; (5) codesign; and (6) empathic design.[3] The goal of these discussions is to argue that the two tensions appear in all these different HCD approaches, that all of them must engage with both sides of each of the two tensions, and that these different HCD approaches can be understood as different attempts to cope with these tensions, because they have different starting points or different emphases.

In Figure 1 a model is presented in which these six approaches are plotted relative to two axes, which represent the two tensions identified above. The
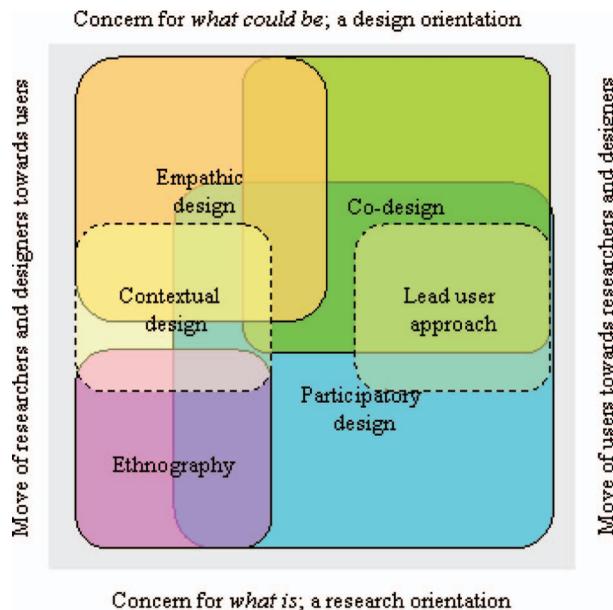

Figure 1. Different human-centred design approaches, with different starting points and emphases.

horizontal axis visualises the tension between researchers and designers on the one side and users on the other side, and their attempts to move towards each other.[4] The vertical axis visualises the tension between a research orientation of describing current or past situations, and a design orientation of envisioning alternative or future situations.[5] This model resembles the model presented by Sanders and Stappers (2008); they used a vertical axis that contrasts 'led by design' and 'led by research', and a horizontal axis that contrasts 'user as subject' and 'user as partner'.

Below, the six HCD approaches are discussed in order to illustrate the ways in which the two tensions are coped with differently in different approaches. The goal of these short texts is not to discuss these approaches in depth, nor is the goal to provide accurate definitions or quick tutorials. Please bear in mind also that these texts are much too short to do justice to the richness of the different approaches and traditions, and that they reflect a somewhat personal view. Furthermore, the approaches will be described, for the sake of argument, as different and separate from each other, although, in reality, there are many similarities and overlaps between them. Moreover, the labels of the approaches are used here to refer to one only specific approach, although it is common elsewhere to use some of these labels – for example, *participatory design* or *codesign* – to refer to a broader range of approaches, rather than to only one approach.

4.1. Participatory design

PD can be defined as 'an approach towards computer systems design in which the people destined to *use* the system play a critical role in *designing* it' (Schuler and Namioka 1993, p. xi). In PD, one attempts to give future users of a system a role in its design, evaluation and implementation. Participatory design has its roots in the 1970s in Scandinavia and was initiated by academics that cooperated with people from trade unions. They saw workplaces becoming automated by computers and strived for democratic values in the workplace and for worker emancipation (Greenbaum and Kyng 1991, Törpel 2005).

Greenbaum (1993) mentioned three different motivations for PD: pragmatically, it helps to get 'the job done better'; theoretically, it is needed in order to facilitate communication and cooperation between people with diverse backgrounds during the research and design processes; and politically, it is desirable that 'people have the right to influence their own workplace, including the use of computer technology'. In PD, users are treated as experts, and it is attempted to bring their (tacit) knowledge and skills into the research and design process. The goal is to let users, researchers, designers and other stakeholders cooperate and engage in 'mutual learning', so that they can jointly create tools that enable people to do what they want or need to do (Spinuzzi 2005).

A classic example of PD is the UTOPIA project (Ehn 1993), initiated in 1981 by the Nordic Graphic Workers' Union and researchers from Sweden and Denmark. In the UTOPIA project, 'Future Workshops' were conducted, which were intended to enable workers, researchers and designers to jointly explore problems and develop solutions. This method consists of three phases: *Critique*, brainstorming about the current situation; *Fantasy*, formulating alternatives, solutions and positive guiding themes; and *Implementation*, defining future actions for the immediate future (Bødker *et al.* 1993). This workshop format illustrates the

fact that PD, although it typically starts with current practices of a specific group of people in a specific situation (*what is*), is also concerned with facilitating researchers, designers and users to jointly explore and envision alternative practices and situations (*what could be*). Furthermore, in PD researchers and designers attempt to participate in users' practices (*move towards users*), as well as users are invited to participate in research and design activities (*move towards researchers and designers*). Therefore, PD is visualised, in Figure 1, to cover a large area of the model.

PD has a relatively longstanding tradition,[6] and its underlying ideas and associated methods, resonate in many other HCD approaches (below).

4.2. *Ethnography*

Another approach is ethnography, a form of applied social science that draws from sociology, anthropology and ethnomethodology. Lucy Suchman (1987) pioneered this approach in the ICT industry when working as a researcher at Xerox Palo Alto Research Center. For example, she studied how people use Xerox copiers and showed movies of people struggling with these machines to the engineers at Xerox, in order to help them to understand users' experiences and to redesign and improve their copiers. In ethnography, researchers and designers go 'into the field' with the goal of understanding how people use products or services. Kujala (2003) remarked that 'field studies are a particularly promising approach for understanding users' implicit and non-verbal needs'.

In ethnography, one attempts to look at naturally occurring situations holistically and from members' points of view: *holistically* means that researchers and designers look at how people and their actions are embedded in social and cultural contexts; and *members' points of view* refers to a focus on how other people create meaning and on their descriptive categories – one would, for example, describe a photocopier as the 'only copier that will handle my oversized originals', rather than as a 'Canon NP9800 copier' (Blomberg *et al.* 1993).

Ethnography is especially relevant for the design and evaluation of ICT applications for computer-supported cooperative work (CSCW) or computer-mediated communication (CMC) (Button 2000, Crabtree 2003) because it draws attention to the social and cultural aspects of communication and cooperation. In that sense, it can be understood as a complement to studies that focus on people as individuals and on their individual cognitive functions. Ethnography is increasingly popular in industry, for example, as a method to conduct market research or to generate input for product development (Ante 2006). However, this popularity has received critique. For example, Dourish (2006) wrote about the 'criteria by which [ethnography] should be evaluated' and argued that one should not diminish ethnography to a method to capture input for design – the infamous 'implications for design' section in a report – but, instead, attempt to do justice to the richness and value of ethnographic investigations.

Ethnography is plotted in the lower-left corner of the model in Figure 1. In ethnography, researchers and designers attempt to move towards users in order to understand users' practices and experiences (*what is*). It is not difficult to imagine a tension between that attempt and their tendency to be also concerned with the product or service on which they are working (*what could be*), for example, their concerns for drawing conclusions and delivering results.

4.3. Lead user approach

The lead user approach is based on the observation that many ideas for improved or new products or services originate in the minds and hands of innovative users and do not always come from professional researchers or designers (Von Hippel 1988). Von Hippel defined lead users as people who have 'two distinguishing characteristics: (1) They are at the leading edge of an important market trend(s), and so are currently experiencing needs that will later be experienced by many users in that market; (2) They anticipate relatively high benefits from obtaining a solution to their needs, and so may innovate' (2005, p. 22). Lead users experience a problem or a need that they cannot fulfil with a current product or service and develop modifications or novel applications, or new products or services. A company or organisation can invite such lead users to help researchers and designers to jointly develop improved or new applications, products or services.

A difference between the lead user approach and participatory design is that the lead user approach is typically oriented towards commercial and business concerns, whereas participatory design is typically oriented towards concerns for democracy and emancipation. The lead user approach is plotted, in Figure 1, on the right-hand side because the focus is on users moving towards research and design activities, and in the middle because it is concerned with people that encounter problems in their current practices (*what is*) and develop innovations to solve these problems (*what could be*).

Interestingly, some examples of involving lead users can be found in areas such as the design outdoor or extreme sports equipment (Lüthje and Herstatt 2004, Lüthje *et al.* 2005). In such areas, people are passionate about their sport and improve their equipment or develop new equipment. Other examples come from the software industry, in which the lead user approach is applied in open-source software development, user-generated content or crowd sourcing. Moreover, it has been suggested that lead users can be provided with 'toolkits' so that 'manufacturers actually abandon the attempt to understand user needs in detail in favor of transferring need-related aspects of product and service development to users' (Von Hippel and Katz 2002). With such toolkits, people would be able to develop, modify or customise their own products or services.

4.4. Contextual design

Contextual design (Beyer and Holzblatt 1998) draws from ethnography and participatory design and is intended to help researchers and designers to observe people in a natural context (often a work context), to discuss their observations in a multi-disciplinary product development team setting, and to translate these observations into specifications for an improved or new product or service (often an ICT application). Several perspectives are suggested for organising observation and discussion, such as: what people actually do; how they communicate; the exercise of power and the role of culture; the artefacts that people use; and people's physical environment (Beyer and Holzblatt 1998).

In Figure 1, contextual design is plotted on the left-hand side because it focuses on researchers and designers moving towards users and their practices, and in the middle because it is concerned with developing an understanding of current practices (*what is*) and using that understanding as input for the design process (*what could be*).

Contextual design has become popular in industry, for example, in commercial software development, as can be illustrated by the move from being presented as a research method, as 'contextual inquiry' (Holzblatt and Jones 1993), to being presented as a tool for product development, as 'rapid contextual design' (Holzblatt *et al*. 2005). Looking at this critically, one could observe the risk of contextual design being commoditised into a tool that can be used instrumentally, rather than a method for inquiry. The focus on the direct translation of field observation into product specification brings the risk that project-team members foreground their knowledge *about* users – partly based, of course, on their interactions *with* users – over knowledge *from* users.

4.5.   Codesign

The term *codesign* is used here to refer to the work of Sanders and people with whom she cooperates (Sanders and Dandavate 1999, Sanders 2000). Sometimes, the term *co-creation* is used, rather than *codesign* (Sanders and Stappers 2008). Codesign can be understood as an attempt to facilitate users, researchers, designers and others – or: diverse people with diverse backgrounds and skills – to cooperate creatively, so that they can jointly explore and envision ideas, make and discuss sketches, and tinker with mock-ups or prototypes. In codesign, 'everyday people' are participants and co-creators, rather than customers and users (Sanders 2006b), and they contribute as 'experts of their experiences' (Sleeswijk Visser *et al*. 2005) to the research and design process.

Sanders (2000) argued that in traditional market research one tries to capture 'what people say', for example, via focus groups or interviews, and that in traditional ethnography one tries to capture 'what people do', for example, via observation. Alternatively, she advocated focusing on 'what people make' and on facilitating users, researchers and designers to jointly create things. This can be done, for example, by developing and using 'generative tools' that can establish 'a shared design language' and enable people to 'communicate visually and directly with each other' during the creative process (Sanders 2006a).

Codesign can be thought of as a contemporary form of PD, with tools and techniques added from other traditions, such as the visual arts. PD and codesign are both concerned with understanding current practices *and* with envisioning alternative practices. However, their starting points can be – but do not have to be – different. In PD one can involve a group of people who currently work together and take their current practices (*what is*), and often a specific problem, as starting point to develop a product that these people will actually be using in the future. Conversely, in codesign one can invite people who have never met before, and start with an idea for a novel technology or a putative opportunity (*what could be*) and then jointly develop a product that will be targeted at a larger mass market. Because of this potential difference, codesign is plotted more towards *what could be*, in Figure 1, relative to PD.

4.6.   Empathic design

In empathic design, researchers and designers attempt to empathise with other people's experiences. For example, Leonard and Rayport (1997) advocated observing customers carefully in order to discover their latent needs and proposed

the following procedure to do that: observe; capture data; reflect and analyse; brainstorm for solutions; and develop prototypes and possible solutions. Koskinen and Battarbee (2003, p. 47) described empathic design as a range of 'empirical research techniques that provide designers access to how users experience their material surroundings and the people in it', as a range of approaches through which designers can empathise with other people's experiences in different physical, social and cultural contexts.[7]

There is a range of empathic design techniques available, which often combine observing users, role-playing and playing with prototypes. In order to understand people with limited or no vision, designers can do practical exercises while they themselves are blindfolded (Fulton Suri *et al*. 2004). Designers and users can jointly participate in role-playing to create or evaluate ideas for new products and use a 'magic thing', a simple non-functioning mock-up to which one attributes imaginary functions (Iacucci *et al*. 2000). Designers can go to a location where the innovation they are working on will be used, and engage in 'body storming' to become acquainted with the location (Oulasvirta *et al*. 2003). Or they can observe people who use 'low-fi' prototypes while improvising current and future tasks, as ways to better understand usage and to further develop their prototypes (Svanaes and Seland 2004).

Empathic design is different from ethnography because empathic design often focuses on *what could be* and one intervenes in users' practices, for example, by introducing prototypes or role-playing, whereas ethnography focuses on *what is*, typically without intervening. Furthermore, empathic design and codesign can be seen as different ways to bridge the gap between the world of researchers and designers and the world of users. In empathic design, researchers and designers attempt to move towards users and their experiences, whereas in codesign, researchers and designers invite users to move towards the project and to contribute to it. Therefore, empathic design is plotted in the top left corner of the model in Figure 1.

An example of a popular tool is the use of *probes* (Gaver *et al*. 1999), for example, in a process of *context mapping* (Stappers *et al*. 2003, Sleeswijk Visser *et al*. 2005). People, in their role of users, can use these probes to report on their live or their work, for example, by writing in diaries, answering questionnaires, making photographs or creating visual materials, in order to capture their daily life experiences or to express their ideas.[8]

5. Examples from practice

In order to illustrate these two tensions, I will provide several examples, from my experiences of working in two HCD projects (Steen 2008). In each of these projects, a team of researchers, designers and developers cooperated with each other and with a specific user group in order to develop a telecom application for this group. One team developed a telecom application in cooperation with police officers, focusing on the work of community police officers and emergency police officers. The other team developed a telecom application in cooperation with people that provide 'primary' informal care to people who suffer from dementia and who live at home – often these informal carers' husband or wife.

The projects were based on two ideas: on a content level, the idea was to develop a telecom application that would help people to communicate and cooperate better;

and on a process level, the idea was to cooperate with users throughout the project. There were project team members with their experiences, knowledge and ideas for some future technology that would improve communication and cooperation between people. In addition, there were users, with their experiences, knowledge and ideas about their current practices. The projects were attempts to bring together these people and their diverse expertises, experiences and ideas.

5.1. *Police project*

In the police project, we organised a series of four workshops with various groups of police officers, in which we developed and evaluated, in an iterative process, a telecom application. Between the first and second workshop we conducted ethnographic observation in order to better understand police work. And, parallel to the third and fourth workshop, a prototype was created for a telecom application that would help police officers to share 'implicit' knowledge, so that they can cooperate more effectively. This approach drew from participatory design and codesign, in that we invited police officers to discuss their current practices and to explore alternative practices, and from ethnography and empathic design, in that we attempted to understand the police officers' work and to empathise with them.

Each interaction with police officers influenced the decision making within our project, which is the intent of HCD. However, it could also be argued that we stayed within our comfort zones by staying close to the focus of our project, and that we unintentionally missed several opportunities to learn more about police work and how to help police officers to cooperate better.

In the first workshop, the police officers talked about their current practices, about some of their information and communication processes, and about the tools they use to input or access information and to communicate and cooperate with each others. We closed the workshop by formulating four problems, as options that can be further explored. After the workshop – without police officers participating in the decision-making process – we chose one of these options to work on in our project: the option to help community police officers to communicate and cooperate with co-workers. We chose to focus on themes that we could directly relate to the project's focus on communication and telecom. As a consequence, we paid little attention to, for example, the police officers' processes of inputting or accessing information, the systems they use to do that, and the problems they experience with these (cumbersome) processes and (difficult-to-use) systems.

Another example of not paying attention to what mattered a lot to the police officers occurred during lunch after another workshop. The police officers talked heatedly about their new uniform trousers. They currently wear cotton trousers, but their management wants them to wear woollen trousers, which are much harder to keep clean and must be taken to the dry cleaner's. 'We don't want woollen trousers', they said. By listening better to them, we might have learned more about how police officers experience their work and the tools they use, and how they experience having innovations imposed on them by management – be it new uniforms or a new telecom application.

Because of our tendency to interpret the project's focus rather narrowly, we missed several topics that were important for police officers. The project could have benefited from paying more attention to these topics; maybe we would then have been able to 'learn something that we didn't know we needed to know' (Muller 2002).

This case illustrates how HCD practitioners attempt to bridge the gap between them and users (the horizontal axis of Figure 1). It illustrates that practitioners will have to decide how and when to move towards users and users' experiences, and how and when they let users contribute to the research and design process. Reflecting critically on this case, it would seem that HCD practitioners can tend to privilege their own ideas and experiences over users' ideas and experiences.

5.2. *Informal care project*

In the informal care project, diverse approaches were applied, drawing from participatory design, codesign, ethnography and empathic design (similar to the police project), and also from quantitative social science. Some project team members studied the needs of informal carers and of people who suffer from dementia for whom they provide care, by conducting a literature study and a questionnaire-based survey with a large number of such couples (*dyads*). They did this within a psychology tradition of describing a current state of affairs and developing a statistically valid presentation of people's needs (*what is*). Parallel to that, other project-team members conducted additional, relatively informal and explorative interviews and a series of three interviews with three *dyads*, in order to inform and inspire their creative and iterative process of understanding other people's needs and designing and evaluating a telecom application together with them. They did this within a codesign tradition of jointly exploring and envisioning future possibilities (*what could be*).

These different approaches caused friction between the project team members, for example, about the added value of doing the codesign interviews in addition to the survey and about combining the different approaches productively.

For example, there were complications in the process of interpreting the survey findings – which were a key source for discussing and deciding whose needs and which needs to focus the project on. There was some confusion, for example, about the meaning of some of the categories of 'frequently reported needs'. Moreover, the process of defining a problem to address took longer than expected; it took several project team meetings to jointly decide whose need and which need to focus on. Some project team members – especially those with extensive experience in dementia care – advocated focusing on solving the needs of informal carers because that would improve the situation for both them and the people with dementia for whom they provide care. Whereas others, especially some in design roles for whom dementia care was a relatively new topic, tended to focus on the needs of the people with dementia, possibly because they empathised with these people's sorry conditions. During one discussion, one project-team member remarked: 'Our need is to do something about that problem'. We, the project team members, felt a need to create a telecom application and we were looking for an appropriate target group. Eventually, we chose to focus on the 'primary' informal carers' needs and developed a telecom application that helps them to share their tasks with others, in order to alleviate their burden and to prevent them from burning out.

One can think about ways to organise communication and cooperation to run more smoothly. On the other hand, it has been argued that team work and creativity need some friction between people's approaches or ideas (Buijs 1998, Isaksen and Ekvall 2010).

This case illustrates the difficulty of productively combining research and design orientations in HCD (the vertical axis of Figure 1). It also draws attention to the influence of methods to study users' needs on one's perception of users and their needs (Rohracher 2005), and on the choice to focus on a specific user group or need. Moreover, it illustrates the difficulty of organising effective project iterations and multi-disciplinary team work. In HCD, communication and cooperation are critical, not only between project team members and users, but also between project team members.

6.   Concluding remarks

The people who are involved in human-centred design (HCD) projects need to cope with two tensions. They have to bridge the gap between researchers and designers on one side, and users on the other side, so that knowledge and ideas of all participants can be brought together constructively. Also, they have to be concerned with both understanding current practices and with envisioning alternative practices. These tensions are inherent in HCD and cannot be solved. One possible way for HCD practitioners to cope with these tensions is by critically reflecting on their methods, their own roles – their usage of power, their agency – in their projects. Such reflection and reflexivity is especially relevant at moments when decisions are being made in a project, for example, about which problems to focus on or which solutions to develop.

HCD practitioners can, for example, try to be aware of the approach they follow or the method they apply; they can try to be aware of the context and the tradition in which that approach or method emerged and of its specific characteristics, its benefits and limitations. Such reflection can help them to more consciously follow a specific approach or apply a specific method. Furthermore, reflection on their own roles and on the roles of users can help them to more mindfully cope with the two tensions. They can, for example, reflect on the ways in which power and agency are distributed at certain moments in a project, so that they can more explicitly choose how to organise the project, how to act, how to make decisions. When conducting ethnographic fieldwork or empathic design, for example, they can choose to put aside their own ideas and knowledge, at least temporarily, and focus on users' experiences, knowledge and ideas. Or, when conducting participatory design or codesign, they can, for example, choose to allow users to contribute their perspectives, ideas and knowledge actively and creatively.

For many HCD practitioners such reflection and reflexivity will require an effort, especially if their projects are complex and pressure is high, or if technological or economic concerns prevail over users' concerns. However, their efforts can be worthwhile because by becoming more aware of their practices and of their roles in these, they can attempt to change their practices and to bring these closer to the ambitions of HCD design of being open towards others and of jointly learning and jointly creating.

Notes

1. See, e.g. the Aalborg University's programme for Human Centred Informatics, which brings together expertise and approaches from the humanities, communication, psychology, informatics and other fields, and draws from the Scandinavian tradition of Participatory Design.
2. An 'emerging, interdisciplinary academic field broadly concerned with computing and computational artifacts as they relate to the human condition' (Wikipedia, accessed 15 September 2010). See also the US National Science Foundation programme for Human-Centred Computing.
3. These six approaches were selected using three criteria: they are commonly used in the ICT industry (e.g. in interaction design or service design); users are directly involved in them (excluding, e.g. approaches in which users participate indirectly, such as questionnaires); and they can be applied in the early phases of a project, where involving users can significantly influence the project (excluding, e.g. market trials, which are typically done in later phases).
4. This axis is similar to the (vertical) axis in a overview by Muller and Kuhn (1993) ('Who participates with whom in what', ranging from 'Users directly participate in design activities' to 'Designers participate in users' world(s)'), and to the (vertical) axis in a review by Kaulio (1998) ('Type of customer involvement', ranging from 'Design by' via 'Design with' to 'Design for').
5. This axis is similar to the (horizontal) axis 'User centred vs. Designer-centred' of the Methods Lab (Aldersey-Williams *et al.* 1999), and to the (horizontal) in an overview by Koskinen and Battarbee (2003) of design research methods, ranging from 'designer-centred design (imagined users in imagined situations)' to 'user-centred design (real users in real situations)'.
6. For discussions of contemporary PD, see, e.g. the Participatory Design Conference series (e.g. Ehn 2008), the Critical Computing Aarhus 2005 conference (e.g. Shapiro 2005, Törpel 2005), or discussions of PD in relation to co-creation (Sanders and Stappers 2008), communication within project-teams (Sleeswijk Visser *et al.* 2007), service design (Holmlid 2009) or innovation processes (Buur and Matthews 2008).
7. A key issue that seems to be as yet undecided is *how* to develop empathy: should designers try to put aside their own experiences and focus on the other person's experiences? Or should designers try to connect with their own experiences, informed or inspired by the other person's experiences? Sleeswijk Visser (2009) discussed different processes through which designers can develop empathy for users: through direct contact with users; through indirect contact, e.g. via user researchers who construct personas to represent users; or through role-playing of practices that are similar to users' practices (without actual contact with users).
8. Probes can be used in different ways, for example, to prepare and sensitise users, researchers and designers before a creative discussion, so that their discussion and cooperation can be more effective (Mattelmäki 2006, Sleeswijk Visser 2009) (which can be considered a type of codesign), or to collect input for the creative process, in which case it is not thought necessary that the people who filled in the probes actually participate in the creative process (Gaver *et al.* 1999) (which can be considered a type of empathic design).

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