Four approaches to user modelling—a qualitative research interview study of HCI professionals’ practice

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Received 7 August 2003; revised 18 March 2004; accepted 18 April 2004

Available online 25 May 2004

Abstract

In this paper, four types of experienced HCI Professionals are interviewed about their different ways of describing users. By use of the qualitative research interview technique of thematizing the dialogue as explicit, implicit and constructive conversations about users, these differences are explored. The research shows that the traditional usability engineering approach to user description produce person descriptions that are filled with idiosyncratic information about the individual in the particular test situation. Less traditional approaches to user modelling give other kinds of schematic user typification in terms of the users’ roles, users’ social events or users’ self-concepts. Despite the obvious fallacies in these approaches, typification of users appears unproblematic for the experienced HCI professional, because in practice user types are rich conceptual structures that support professional user modelling. Accordingly, we suggest that it might not be that important to discuss why user types exist, but rather to study their application and change and under which conditions they become user stereotypes, and how we may counteract the negative effects of user stereotypes on design.

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Keywords: User modelling; Qualitative research interview; HCI professional; Stereotype

1. Introduction

In the last decades of the 20th century, when human–computer interaction became an issue in control-room and office software development, it seemed obvious that tests of
design proposals would improve system performance, and could therefore only be done
with people who had been selected as expert users due to their extensive experience with
and knowledge of the system.

In the control-room system development projects in the early 90’s that the author took
part in, it was assumed that understanding the user’s perspective required at least a first-
hand experience with the kind of systems to be designed and some programming skills.
People without these qualifications were not admitted to be part of the system development
process. When a new control-room system was to be developed, you looked for experts on
that kind of systems. And the introduction of a new kind of programming environment
changed the general opinion about who were expert users. These peoples’ performance on
running system prototypes was timed and their errors were identified, categorized,
calculated and evaluated. Occasionally, their satisfaction with the design was also
measured on a scale, and all this information was fed back to owners of the system
development process, with a note saying that perhaps some of the users should be seen as
non-experts. None of us were trained in how to characterize different kind of users of
software, though it was not hard to use common sense and literature to find some relevant
distinctions, like fast and skilled vs. slow and careful, or display-oriented vs. environment-
oriented. Informally, different user descriptions were discussed among system developers
and domain experts as well as with staff from marketing, personnel selection and
IT-consultants. Though we never did discuss this explicitly at that time, user
characterization was an ongoing issue in all the system development groups.

Today, in all phases of system development, HCI Professionals offer efficient and
insightful hypotheses on the relevant characteristics of the users, who are going to use the
system. They are created as persons, characters and/or target groups in the analysis phase,
they are located in storyboards and scenarios to create visions of design, and they are
invited as users to help test the quality of the product, to name just a few of the applications
of user descriptions in system development today. A recent study of a small Danish HCI
community shows that HCI Professionals in this community alone were aware of no less
than forty different theoretical approaches to usability work (Clemmensen and Leisner,
2002). Furthermore, the development of new technology and new approaches to human–
computer interaction continues to ‘flood the field’ with new theories and methods (Rogers,
2001; Whittaker et al., 2000). In the face of this overwhelming supply of different
approaches to human–computer interaction, the question is: Do the HCI Professionals, as
did the system developers earlier, see users as experts who should be selected exclusively
on basis of their computer skills?

The obvious answer is that they do not. HCI Professionals rely instead, as the system
developers did in the above mentioned control-room case, on their insight into the users’
worlds and on their knowledge of relevant social science theory (though some kind of
implicit, stereotypical descriptions sometimes becomes visible and though system
characteristics obviously are important). They use this to create likely hypotheses about
the relevant user characteristics such as who the users are and which major events happen
in users’ worlds. Thus they do ‘user modelling’; i.e. the conscious attempt to learn to know
the users—and to describe them—in a way useful to design.

The purpose of this paper is to provide insight by the use of qualitative interviews into
what constitutes effective user modelling practice in the mind of the HCI professionals.
The rest of the paper falls into three sections. The first section presents the earlier studies of user modelling in practice and discusses the finding that designers often see themselves as user models, in spite of the obvious fallacies in this approach. This section also presents findings that explain why we should study the thinking of the HCI professional. The second section describes the methodology, results and conclusion of a qualitative research interview study with HCI Professionals. The third and final section of the paper discusses the interview findings on user modelling practices, and discusses also possible sources of systematic errors in these practices and remedial actions.

2. Studies of user modelling

Explicit assumptions about users are found in ‘user modelling’. The requirement that a computer application treats users as individuals with unique personalities, goals, feelings, etc., demands that the designer is precise in the description of users and their cognitive and emotional motives, needs, etc. This is reflected in the ‘affective computing’ paradigm (Klein and Picard, 1997; Picard, 1997) that seek to allow the computer to read and demonstrate feelings, and reflected in the concept of ‘user modelling by stereotypes’ such as novices and experts (Rich, 1979) that has inspired much research aimed at providing systems with models of users that allows the system to adapt to different users. However, such simple characterizations of users have been condemned for being too much dependent on the models specific (and implicit) context, and for not being applicable to users globally (Fischer, 2000). Instead, explicit assumptions about the ‘communication agent’, i.e. the many different kinds of users, should be constructed empirically by means of dialogue with and observation of users (Fischer, 2000). Stereotypic user models can thus be seen as just one subtype of designers’ many possible models of users.

The user models that are relevant for design practitioners when they assess users’ needs may be any representation of the potential user that the designer creates and/or use to make predictions about the actual user. Thus user models in theory and user models in practice may not be identical. They could even be seen as orthogonal (Hasdogan, 1996). The theoretical models (physical, cognitive, performance and psychosocial models), which are known from the literature in marketing and HCI, could, when applied in practice, better be classified as empirical (published materials, tools and software assumed to represent the user population of interest), experimental (representative sample of user population or the designer himself/colleagues) or scenario-based (formal or informal storylines relating to users, usage, usage environment and usage circumstances) models (Hasdogan, 1996).

Empirical user models. Contrary to the suggestion by Fischer (2000) who argues for the use of empirical user models, Hasdogan (1996) in her empirical study found that most industrial designers were reluctant in their attitudes towards empirical user models. A main reason for this lack of interest was that the material available to designers lacked information on peoples’ cognitive and emotional attributes and included exclusively anthropometric data. This kind of tabular, statistical information on human dimensions did (1) not aid design thinking, (2) not offer practical ways to test layouts, (3) not offer the designer relevant information for new kinds of products. Furthermore were most of the designers of the opinion that human behaviour when using a product is very complicated,
and that many aspects of such behaviour thus cannot be modelled by statistical or computational means (Hasdogan, 1996).

Experimental user models. The designers in Hasdogan’s study agreed that experimental user modelling—experimenting with real users—is one of the most essential parts of the design process. The idea of live user involvement was considered by designers to vary from designers using him or her self as the user and acting out the usage process, the use of colleagues or relevant representatives, to the full involvement of real users in the design process. Some designers were, however, reluctant towards this involvement of real users, because (1) the designers themselves were not always allowed by their companies to take part in the testing, (2) designers were convinced that representative real users suffered of the tendency to prefer familiar products and reject new design ideas, and (3) that it was difficult to eliminate side effects of the artificial test environment on the user opinions and behaviour. Therefore, using one self or a colleague as a user model was one of the most commonly employed methods and was judged very positively (Hasdogan, 1996).

Scenario user models. Hasdogan’s main finding, however, was that designers use scenarios, each involving an actor/actress, who usually is the designer him or her self, and a series of events representing the actual usage of the product. Designers simply were of the opinion that scenario building is the core activity in the design process, and an instinctive part of designers thinking.

Scenarios emerge traditionally from accident analysis, experiments and simulations. Simulations and accident scenarios, with actors, products, scenes and actions, help designers to foresee possible safety risks with the product. But more interesting to designers in Hasdogan’s study were the scenarios that build on cognitive psychologists ‘mental models’ and similar concepts. These scenarios suggested how users may use complicated sequences of controls and they helped designers to anticipate future users’ interactions with the product. Yet another kind of scenarios of interest was those build on market researchers ‘psychographic’ and ‘life-style models’. This kind of user profiling, as carried out by the designers in Hasdogans study, was a process of considering the personality and life-style of the user throughout the whole product cycle, and it could involve extensive reference to the usage patterns within that lifestyle (Hasdogan, 1996).

The idea of having the designer acting out the user scenario him or her self has in itself been suggested as unique design method. The benefit of this method should be that it may support collaboration among various types of professionals and help them understand from the user point of view (Yamazaki, 2003). Despite this potential for collaboration around scenarios, the common way to build a scenario among the designers in Hasdogan’s study was to empathize with the user, i.e. that the designer put him or herself in the users situation and then wrote a short story about how the new design would be used.

Persona user models. Recently the use of empirically based, abstract descriptions of people has gained popularity and has been developed into a well documented design practice (Cooper, 1999; Goodwin, 2002; Nielsen, 2002; Nielsen, 2003; Pruitt and Grudin, 2003). The main argument for abstracting the user in this particular way is that experience from design projects shows that the use of descriptions of people in the form of ‘personas’ engage designers more than design based primarily on scenarios (Nielsen, 2003; Pruitt and Grudin, 2003). According to Pruitt and Grudin, currently there are no explanations of why many prefer to develop personas, instead of focusing directly on the scenarios that describe
the actual work processes that the design is intended to support. But a potential candidate to a theory of using ‘personas’ in design is, according to Pruitt and Grudin (2003), the ‘theory of mind’ that says that we as humans always use our knowledge of other peoples mental states to predict their behaviour (Astington and Jenkins, 1995). So, after HCI researchers have struggled for years to expand the original cognitive basis for HCI to include a concept of the individual’s environment (Green et al., 1996; Stary and Peschl, 1998), a renewed focus on mental representations seems to arise from research as well as from experience from design practice.

**Other user models.** User models are also implicitly applied in design. Hertzum and Jacobsen (2001) and Jacobsen (1999) studied usability test methods and showed that HCI Professionals in their work as usability test evaluators sometimes make unfounded and inaccurate assumptions about the users, even when applying well known and theoretically and empirically well founded methods such as Cognitive Walk through and think-aloud methods. This finding was replicated by Vermeeren et al. (2003), who found differences in the ways that usability test evaluators interpreted users’ intentions. Thus empirical data on implicit user representations in usability test work also indicates a need for a focus on what goes on in the head of the HCI Professional.

User modelling has changed across time. Before HCI existed as a discipline, interfaces represented the internal architecture or programming of the system. From a practical perspective, the distortions introduced by modelling users need therefore to be evaluated in the light of the problems encountered with the types of systems that are designed without any user input. On top of that, however, it makes a difference which kind of user input that is used for design. Already in 1983, Dagwell and Weber showed that inadequate conceptualization of users held by system designers influence system designers to design tightly structured systems that lower the quality of working life, and manifest itself in various behavioural problem at end-user level, e.g. infrequent system use (Dagwell and Weber, 1983, p. 988). A decade later, Bannon (1991) pointed out how the ‘typical’ representation of users changed in the history of HCI from the passive human factor component of the 80s to the active, autonomous human actor of the 90s. And a few years after, Cooper and Bowers (1999) deconstructed the whole idea of a representing the user in HCI; they identified the cognitive psychological model of the user as the ‘first wave HCI’ and Bannon’s ‘active actor’ as the ‘second wave HCI’. Furthermore, they saw the increasingly heterogeneous nature of the user representations as a response to immanent, disciplinary tensions within the HCI discourse. Recently these many different perspectives seem to develop together under the heading of ‘user centered design’ (Karat and Karat, 2003). All the developed techniques that involve users can now be called user centered design. The knowledge and skills associated with user centered design has not, however, yet been captured in academic training programs (Karat and Karat, 2003).

2.1. Confining the analysis of user modelling to the thinking of HCI Professionals

The paragraphs above describe the way user modelling is commonly performed. The application of these methods is what we may call user modelling practices. The study of user modelling practices could now go forward by comparing the developed user models directly with the users actual experience or other data on the users; it would then be
possible to assess the degree of interpolation and extrapolation that the HCI professionals applies in their user modelling, and decide on which user modelling practice is best. In this sense, the knowledge and skills of the HCI professional, which we haven’t yet captured adequately in academic training programs (Karat and Karat, 2003), is not important.

It is, however, reasonable to assume that the user modelling practice of a HCI professional is directed by or at least associated with the professional’s conceptual structure (Meister, 2004), forms of thinking (Isomaki, 2002), mental schemata (Chevalier and Ivory, 2003), and, insofar the HCI professional acts as a system developer, by the attitudes towards the user (Dagwell and Weber, 1983; Kumar and Bjørn Andersen, 1990), the system developer paradigm (Hirschheim and Klein, 1989) and by the development team’s shared frames of reference (Orlikowski and Gash, 1994). Thus there could be expected some consistency between a professional’s choice of method for a given study of information behaviour and his or her view of the nature of reality (Cooper et al., 1995; Wilson, 2002). The HCI professional’s thinking and reflection and general approach to the problems encountered in user modelling interacts with and influences the user modelling methods.

In practice, it might appear that the HCI professional’s user modelling methods and conceptual structure are distinct, and to some degree perhaps it is so. It is possible to think of the HCI professional’s conceptual structure as consisting of a basic approach to reality that to varying degrees is associated with the user modelling methods applied in everyday practice (Meister, 2004). This study of the HCI professional’s approaches to user modelling therefore includes both the study of the application of various user modelling methods and the study of the HCI professional’s approach to reality. Both might vary across different professionals. Different professionals may apply different user modelling methods, e.g. ‘persona’ or ‘experimental’ methods, and they may either approach the user as an ‘intersubjectively constructed meaningful social actor’ or as a ‘real user’. We cannot assume that the HCI professionals necessarily follow an approach in studying their users that is similar to our own approach to studying them. After all, that would lead to the unreasonable requirement that the practitioners observed all acts as they were psychologists or anthropologists (or whatever approach we as researchers have), which is a requirement of epistemological and ontological coordination across disciplinary boundaries that is both impossible and unwanted (see e.g. Forsythe, 2001). In our study, for example, the HCI professionals studied may not be out for, as we would, discovering their users’ ‘lifeworlds’ or their users’ ‘actual experiences’, but out for something different when describing their users; and what they are out for, is what we want to know.

3. Methodology

The empirical part of this paper ask: how do HCI Professionals, within their work life world, see the users of software? The interview study reported here was carried out with

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1 A recent survey of Danish HCI Professionals indicated that most have a high interest in one or two particular theories or methodologies, but that there were no significant relations between the interest in a given theory and the use of methods; e.g. a person interested in contextual design might be happy to use a method with a theoretical basis that is foreign to the contextual design approach (Clemmensen, 2003).
some of the most experienced HCI Professionals in Denmark. The study took place as a qualitative interview study in the tradition of the qualitative research interview, which allows the researcher to ask questions to different issues in the interviewees’ life-world, including practical issues of how to do things and cognitive issues such as personal and professional epistemologies (Kvale, 1996).

This approach makes this study different from other studies in several ways. Instead of investigating how the conception of the user has changed or should change in HCI research (Bannon, 1991; Fischer, 2000; Rogers, 2001), this study investigates how HCI Professionals in practice learn and think about their users. And, instead of asking practical designers to give their opinion on social scientists’ user models (e.g. Hasdogan, 1996), this study asks academically trained HCI Professionals how they construct and perceive users. Furthermore, instead of studying how HCI Professionals apply user descriptions indirectly in their work with usability tests (Hertzum and Jacobsen, 2001; Vermeeren et al., 2003), this study asks directly to the user descriptions. Finally, this study also explores something the other studies didn’t: what do HCI Professionals do when they have no suitable theory or method for describing users at hand?

3.1. Typification of the HCI professional

In our phenomenological and social-psychological approach to the study, we approach the HCI professional as an ideal type of social actor that we can use to study the professional typification of the users. In this view, typification of users have much in common with the ways that we as humans in our everyday social interactions typifies other people (Wilson, 2002). The professional or scientific typification occurs, however, within a set of research objectives. For example, when the HCI professional study the user with the aim of assessing the usability of a future product, he or she may create ideal types of users. And when we study the HCI professional with the aim of understanding various approaches to user modelling practice, we, instead of typifying the user, create and apply ideal types of HCI professionals.

In our ideal type approach to the HCI professional, we consider him or her as less than a real, red-blooded human being. Ideal types apply to some degree of anonymity (Kurrild-Klitgaard, 2001). Furthermore, the HCI professional is represented by us as a personal ideal type with invariant motives, more than as a formal ideal type (course of action). We do not argue that a certain modelling approach a priori is the ‘best practice’. Instead we use the ideal types with the purpose of exploring and understanding how the HCI professional experience his or her user modelling practices.

We are not seeking the ‘average HCI professional’. This study will not be associated with statistical means and averages. This is because the ideal type HCI professional comes out of an understanding of the motives, ideas and aims of the acting professional and of the means she or he applies. Statistical averages denote the behaviour of the member of a group, class, type that are already constituted by means of a definition or characterization of some kind (Von Mises, 1996 (1949), p. 60); we have not defined the global group of HCI professionals beforehand and will not try to measure averages or differences. Thus we are not concerned with ordinal or interval measurement of variations in professionals’ user modelling practice, and will not attempt to locate the ideal types of professionals on
a continuum, ranging from e.g. ‘novice’ to ‘expert’ user modelling behaviour. Our choice of nominal, instead of ordinal or interval, variables does not mean that we are against the idea of measuring user modelling practice on a continuum, or think it is impossible. It could be important to try to place user modelling approaches on a continuum. For example, an Indian HCI professional may be able to develop an evaluation methodology that capitalizes on young Indians’ intense interest in drama and cinema, something an American or European professional might not be able to do (Tom Plocher, personal communication). However, we believe in first understanding each user modelling approach better, by developing ideal types of HCI professionals, before we measure differences. Our typification of HCI professionals is used to investigate user modelling practice as it is experienced in consciousness and in cognitive and perceptual acts. We describe the HCI professional’s approach to user modelling without a consideration of its causes, objective reality or appearance.

A critique of this ideal type approach is that there is a danger that the HCI professional ideal types easily come to remind one of fictious persons rather than abstractions used for analytic purposes. An ideal type is, however, not meant to be a fictious actor that embodies one side or aspect of a human’s aims or needs. Rather the idea is to develop a representation of a complex phenomena of reality (Von Mises, 1996 (1949), p. 62).

It is important to study why and how user representations are constructed and used in practice. Otherwise the discussion of user models will continue to be caught in choice situations between formal or informal, fictive or empirical, and other dichotomies of user models, when how to understand the relation between these different ways of understanding users and the design objectives is the real issue.

The results of this study are valuable because they inform practice by pointing out existing ways of doing user modelling, thereby hinting at what works and what doesn’t work in a system development context. The study also suggests areas for improving teaching and professional education, e.g. theory based resources that communities should provide for user modelling. Finally, the study provides guidance to how to conduct laboratory studies of the role of HCI theory in tools/method use in usability work. This study relates to another study of HCI work, reported in (Clemmensen, 2003) and to studies of professional knowledge (Bromme and Tillema, 1995). As such, it falls within a research paradigm that basically builds on learning from practice.

4. The qualitative research interview

We wanted to study the different ways experienced HCI Professionals conceptualize their users. Due the cognitive nature of these user modelling activities, we chose, instead of observation of work, the qualitative research interview method. The interviews were 3 h long in-depth qualitative interviews with the most experienced specialists available. They were asked to consider the past year of their working life and to recall concrete instances of relevance in order to ground their statements. The interviews were audio-recorded and notes were taken. The interview guide (see below for the questions) was semi-structured. Thus the approach was explorative and directed towards establishing a conceptual framework for understanding HCI Professionals’ assumptions about users.
The qualitative research interview is a particular form of a research interview (Kvale, 1996). It is “a semi-structured life-world interview, which is…. an interview whose purpose is to obtain descriptions of life world of the interviewee with respect to interpreting the meaning of the described phenomena” (Kvale, 1996, p. 6). The strength of this method is that it captures different participants’ views of a theme and describes a nuanced and controversial human world. In order to provide the transparency needed to validate such qualitative interview studies (Olsen, 2002), we describe in the following how the study proceeded through the seven stages proposed by Kvale (1996): thematizing, designing, interviewing, transcribing, analyzing, verifying and reporting.

4.1. Thematizing

The purpose of the investigation was to develop a conceptual framework that can help understanding how HCI Professionals within their work life world see the users of software. In order to encompass the different answers to this question, different kinds of conversations about user models were necessary. Thus the investigation was thematized around three kinds of conversations: explicit, implicit and constructive conversations about users.

Explicit conversation. Explicit conversation is when the HCI Professional present his or her reality and way of being a professional; this kind of conversation is very much a self-controlled presentation, like when the HCI Professional introduce guests or apprentices to the HCI Professional’s work life and to the explicit ways that user representations are constructed. The theme is here the ‘given’ user modelling methods, which the investigator should describe as precisely and completely as possibly, rather than explain and analyze.

Implicit conversation. Implicit conversation is when the HCI Professional and the investigator discuss on basis of shared, implicit beliefs, i.e. discuss as colleagues the trade secrets of how they do the tricks with representing the users and communicate these to developers. The theme is here the distinction between the theoretical, social science user models and the implicit, everyday stereotypes or ‘theory of minds’, which the HCI Professional also apply when constructing user models. While the investigator lack the necessary information, the HCI Professional can use his or hers knowledge of own history, experiences and social situation to make this distinction.

Constructive conversation. Constructive conversation is the traditional interrogative interview, when the investigator asks questions that make the HCI Professional develop his or hers thoughts on how users are modelled. The theme is here the limits of knowledge of the practice of user modelling, what the investigator can be allowed to know and not to know about this practice, in the interaction between researcher and professional.

By applying these different but related themes, user modelling in practice could be investigated within the intellectual, cognitive and individualistic style of the qualitative research interview (Lelievre and Vivier, 2001; Olsen, 2002).

4.2. Designing

With the themes ready, and within a period of a few months, three-hour long, explorative interviews were carried out with four very different, but all very experienced HCI Professionals from a Danish HCI community called Sigchi.dk.
The explorative design implied that new dimensions in the understanding of HCI Professional’s user modelling practice that emerged due to something the interviewees said, or emerged just because the investigator got wiser, should, instead of leading to discard of the interviews or the whole investigation, be added to the interview and result in a refinement and extension of the interview-guide.

As the aim was to carry out applied research for researchers and practitioners in the international HCI community, company and person sensitive material like company secrets and person-oriented gossip was to be avoided in the interviews. Clearly expressed criticism of individuals or organizations was, however, to be accepted.

To ensure a correct understanding of the meaning of what the interviewee said, control questions and summary techniques were to be used throughout the interviews.

Beforehand it was decided that no linguistic analysis would be attempted, instead a grounded theory approach would be used to analyse the transcriptions. These could therefore be produced in the format of standard Danish language; no informal utterances such as ‘hmm’ and ‘oehh’ should be transcribed, because the important structure to maintain would be the words and the coherence in the dialog in order to analyse the concepts used in the interview.

The chosen interview form, with different conversational forms addressing factual, confessional and inter-subjective information, was unfolded in one-to-one interviews. These kinds of interviews allowed the investigator (the author) better control with the interview situation, more structured data collection and more systematic analysis than is possible in group interviews with mixed voices and interaction between participants (Kvale, 1996). Furthermore, by taking on the investigator role, we could ensure that the investigator had the necessary knowledge and skills and training to do qualitative interviews in general, as well as in particular interviews with members of the kind of elite that HCI Professionals belong to. This would have been difficult to ensure if someone else had done the interviews.

We used theoretical sampling to select the HCI Professionals to interview. Theory of professional knowledge (e.g. Bromme and Tillema, 1995) says that the two important determinants of this kind of knowledge are academic training and practical experience. To ensure large and systematic differences between the interviewees, we decided to consider four types of HCI Professionals. In each case the HCI Professional should have an educational background in one of the academic areas of relevance: technical science, humanities, natural science and social science. Each of the HCI Professionals would then presumably have (this was confirmed in the interviews) developed a professional network of people with similar analyst background as themselves. Furthermore, the participants’ work experiences were comparable in length. To avoid ‘reality shock’ phobia of theory use, the requirement was more than 5 years of postgraduate practical work with HCI issues. The participants’ work areas were similar and included analysis, design and evaluation of interactive systems. Thus only the participants’ academic background and related professional network was varied systematically among participants.

Other attributes of relevance for professional knowledge helped to identify the HCI Professionals as a separate group: culture (Danish nationality), occupation (HCI professional, member of sighci.dk), sex (should reflect the population of sighci.dk...
members), age (similar in age due to a possible generation effect in personal and professional epistemologies).

We named the four case categories metaphorically the ‘bridge builder’, the ‘analyst’, the ‘programmer’ and the ‘designer’. As is illustrated in Fig. 1, the only characteristic besides educational background that systematically varied among these four categories of HCI Professionals was their professional network; other relations such as having worked in the same firm, shared supervisor during post graduate education, occasionally met and talked, studied at some time at the same institution (not same study) all contributed to providing a very rich, varied background as experienced HCI Professionals in the community.

We decided first to interview one HCI Professional from each of the four categories in order to address the differences between their user modelling approaches already in the design of the study. The four interviewees are briefly introduced in the following.

The ‘bridge builder’ interviewee had a background in technical science. He worked as a traditional HCI person with responsibility for presenting the users’ needs to those who implement the design in an instrument producing company. He was a male, middle aged, very experienced civil engineer with professional network among programmers and product developers, a record of HCI related research publications and many years of experience from industry.

The ‘analyst’ interviewee had a background in humanities. His work was primarily abstract synthesis work, and he thus covered a task the bridge builder was not expected to do. He theorized about users with the goal to create a ground for the creative peoples design work. He was a psychologist in his late thirties with a professional network among

Fig. 1. The four categories of HCI Professional (‘bridge builder’, ‘designer’, ‘analyst’ and ‘programmer’) that were used to select, analyse and understand interviewees and their lifeworlds. The lines show the associations between the HCI Professionals and the boxes show the attributes of the HCI professionals.
market analysts, a leading position in an advertising and interaction design bureau, and with 10 years of experience in usability work.

The 'programmer' interviewee had a background in computer science. In his work, he crossed the boundaries to technical design without becoming a technician only; he worked from within the design and outwards to the graphical in the user interface. His goal was to optimize the interface. He was in his thirties, with a professional network among system developers, a background in economics and computer science and extensive experience with the analysis phase of web site design.

The ‘designer’ interviewee had a background in social science. She crossed the boundaries to the artistic. She also valued empathy with the user very high, and felt that the current problem with interface design is that no one has actually successfully created a design that melts together functionality and aesthetic experience. Her focus was on the design of experience-oriented interaction. She was in her forties, and had a network amongst graphical designers and text writers, a proven track of design successes and a clear philosophy of user centered design.

The reason for using this kind of theoretical sampling was that there were not sufficient resources available to do enough interviews for statistical analysis to be applied on the results, hence using a random sampling procedure would be meaningless, and, on the other hand, self-selection would provide opportunities for idiosyncratic interview results. The accessibility of participants played, however, a minor role in the decision to interview only Danish HCI Professionals.

The design also included some replication logic (Yin, 2003 (1984)), because we decided to do $4 \times 2$ interviews: we would interview two participants from each category, but, following the law of falling output (Kvale, 1996), discard interview no 2 in each category, if little new was learned during the interview. Thus four additional interviews were done, one from each category, but then discarded. These four left-outs were: a female psychologist with her own usability company (the analyst category), a male web designer with a background in the social sciences and a position as a manager of a small multimedia company (the designer category), a male computer scientist with his own software company (the programmer category) and a male autodidact programmer/system developer with extensive technical proficiency and experience from large public sector system development projects (the bridge builder category). During the interviews it became clear that these ‘no 2 HCI Professionals resembled their ‘no 1’ in world view in general and in user modelling approaches in particular, so little new was to be learned from their interviews and these were discarded before transcription and further analysis. This procedure left four interviews to be transcribed and analyzed, one in each case-category.

4.3. Interviewing

Before the interview, the participant was briefed about the purpose, background and aspirations with the interview, i.e. the investigator told the participant something along the following lines (it varied in sequence and content, depending on the questions the participant asked and dependent on the participant’s knowledge of the investigator as a person, interviewer and HCI Professional):
The purpose with this interview is to learn about how you work with HCI as a professional. The reason for doing these interviews is that we want to learn and disseminate knowledge about how usability in DK is carried out in practice. The ambition is that our field can benefit from learning about the already developed HCI Professional practice by individuals like you, and we will try to use these interviews to do a research paper and perhaps also a presentation at Sighci.dk [the HCI community the participant was a member of]. Therefore I am ready to listen to your presentation of your work. When you talk about it, think of how it has been during the past year. We will spend as long time you feel is needed to explain your work and your use of theory and methods in relation to actual design projects, which you have participated in. I also have a list of questions, which we, however, can take in any sequence we want. Furthermore, I would like to discuss potential cooperation about the development of methods for user description, etc. We may also share some stories about how things are done in this HCI business. I will record [notes, audio or video] our session, and analyze it further, but if I am going to show the record of our interview to anyone, I will ask you first.

The purpose with this relaxed, but formal, briefing of the interviewee was to establish a social and emotional atmosphere that allowed for (1) an optimum presentation by the interviewee (the interviewee should see the investigator as a guest), (2) a collegial ‘rapport’ between us (the interviewee should feel that the investigator and he/her had same values) and (3) an attitude that allowed for switching between cognitive knowledge seeking and emotional sharing of experiences. Thus, contrary to seeing an interview as either intellectual or emotional, the briefing of interviewees should enable switching when appropriate between modes of conversation.

Each participant was interviewed in his or hers own environment, be it a meeting room at his or her firm or the home office of the HCI Professional. The interview guide was send to the interviewee before the interview. It consisted of 10 broad, open questions related to:

1. Job area (object of inquiry, job function, job content, formal job title, interface to others).
2. Professional network (the participants were asked to characterize their network).
3. Tools used for analysis and presentation (e.g. PowerPoint, Netscape communicator).
4. What the participant considered ‘classic designs’ (e.g. the interface of ‘Norton Commander’, ‘OS/2’ user interface principles, etc.).
5. What the participant saw as prototypical design cases (e.g. the design of a web interface for information seeking, or a form filling page).
6. Object of inquiry (conceptual dimensions and models in usability work).
7. Self-legitimation (Why a specialist like you is needed…complex designs or…?).
8. Area and role in product development (analysis/analysist, etc).
9. Explicitly used theory and methods (sociological theory, design theory, etc.).
10. The products of the participant’s and the company’s work (documentation for user interfaces, brand building, culture changes, campaigns, interfaces, etc.).

These questions were covered in all the interviews, but not in any specified sequence. However, the introducing questions were those about job area and professional network.
and the exit questions were those about the products of the work, because these questions were considered to be easy to answer and to let the interviewee feel on safe ground. The more probing and projective questions, such as ‘which kind of theory do you use…’ and ‘why is a specialist like you needed…’ were asked in the middle of the interview session when the interviewee already felt safe with the investigator and also had plenty of time to answer. Silence was used to indicate to the interviewee that the current topic should be reflected on and further discussed, e.g. when the interviewee had told a little about his or hers understanding on the users, then the investigator could use active listening to elicit further information from the interviewee.

After each interview, the interviewee was debriefed: the investigator made a short resume of what had been learnt, and if necessary arrangements were made for the interviewee to give the investigator material of interest as well as other agreements for potential future contacts.

The interviews were summarized and time stamped immediately upon the researchers return to office.

The quality of the interviews was high due to the interviewees’ personal attributes: They all, in my opinion, were honest in their way of describing their work. They all had the capability to be consistent, well formulated, give concise answers and provide coherent and precise explanations that stayed on track and did not divert from the topic. They gave living descriptions of their life that engaged the listener and could be reported to others—they were used to doing this as part of their work. In particular, the insights the interviewees had in their own methods of work benefited from their special training in observing work. Hence the quality of the interviews was high in terms of the spontaneous, rich, specific and relevant answers from interviewees and due to the on-line interpretation-by-discussion. Furthermore, the investigator tried to be as informed, structured, clear, friendly, sensitive, open, directive, critic, remembering and interpretative as possible in order to produce the best possible quality of interviews.

4.4. Transcribing

The interviews were recorded by taking notes. Thus the important material from the interviews was long citations of what the interviewee said and drawings that illustrated the models visually depicted in words or on paper by the interviewee, together with the investigator’s reflections on these passages. However, as an aid to the investigators memory, recording devices (video or audio) were also used and, in all cases, the devices recorded a clear sound track without background noise. The support provided by the video or audiotape allowed the transcriber to focus on the cognitive content of what was said (propositions made, explanations given, etc.) i.e. the focus was on the validity acquired by having the investigator carefully applying his social and domain knowledge when jotting notes down and when editing the transcriptions. The transcriptions were prepared as plain text files for later analysis with software for visual qualitative data analysis, management and theory building (Atlas.ti, version win 4.2, build 61).
4.5. Analyzing

The most central part of the analysis procedure was the intention of continuing the dialog with the interviewees via close readings of the transcriptions; thus these texts were considered co-produced interviews, not dead protocols, and furthermore, due to the one person—one case category approach introduced above, the investigator was able to have a picture of the interviewee mentally present while reading each of the interviews.

In order to reconstruct the story told by interviewees, the investigator followed four of the possible six steps in the interview analysis method proposed by Kvale (1996):

1. describe the lifeworld (interviewees during the interview)
2. discover new relations (interviewees during the interview)
3. condensate, interpret and feed back (investigator during the interview)
4. interpret transcribed interview (investigator(s) alone)
5. correction through re-interview (investigator/interviewee)
6. acting on interview (interviewee(s) alone)

The first three steps were covered by the three conversational forms chosen for the interview. Thus, the first step in the analysis happened in the explicit conversation, when the interviewee presented his or hers lifeworld. In this step there was not much interpretation or explanation. The second step in the analysis happened in the implicit conversation, in which the interviewee looked inwards and reflected on current practices. The third step happened when the investigator and the interviewee negotiated the meaning and significance of what was said by the interviewee, e.g. the investigator offered an interpretation and the interviewee responded by suggesting a rephrasing: “it was not like that, it was like…” The results of these three steps were interviews that were corrected by the interviewees. It is important to note that these three steps were not performed in a fixed sequence, but happened iteratively during the interview session.

The fourth step happened after the interview session and without the physical presence of the interviewee; the investigator analyzed the text alone. This analysis took form as three sub-steps: First finding a structure, a way to set up the different interviews for the analysis, second, clearing of the material in terms of removing what was not essential from the texts and third the actual analysis which in this case was done as condensation and categorization of meaning, based on the theory outlined in the introduction to this paper, and using techniques known from grounded theory. Thus these three sub-steps in the analysis were performed as ‘open’, ‘axial’ and ‘selective’ coding (Strauss and Corbin, 1998). The first sub-step in the post-session analysis was in fact begun already during the session, and consisted of identification and naming of concepts of interest to the investigation in the interviews (open coding), see Fig. 2. Concepts of interest were found by listening and looking for related utterances that seems to concern the same concept. The investigator segmented each interview in meaningful units of text, and then coded the segments in categories that again were refined during the analysis and by re-reading the interviews. The text segments were mostly on paragraph level and the number of segments varied between 15 and 22 for the four interviews. These were coded in 12 categories
The next sub-step was categorization of related phenomena (axial coding). Here you begin to look for relations between categories and consequences thereof. (In Fig. 3, see how the categories (‘codes’) which in the example are ‘users’, ‘interfaces’ and ‘objects’, are marked with boxes with numbers (e.g. 9–2) that indicate the amount of citations associated with the category and number of other categories related to the category. Also, the small surrounding icons mark citations from the interviews no 1–4, with a number showing the line (e.g. 16 or 20) in the interview text the citation can be found). In this sub-step,

Fig. 2. Sub-step one: ‘Open coding’. This is already begun when the investigator takes notes on the paper medium during the interview.

Fig. 3. Sub-step two: axial coding of the relations between categories. Note: in this example, the relations between user, objects and interfaces are shown. The ‘R’ relation is an association, i.e. no particular directions between the categories are assumed in this example. The small icons show which interview (first number) and which citation from that interview (second number) that ground a code. The ‘book’ icon illustrates a note related to some citations, which also works as a commentary to the category.
we decided that the two categories of ‘role’ and of ‘theory and methods’ referred to theoretical aspects of user modelling practice (role referred to implicit ways of doing user modelling, the secrets of the trade, and theory and methods referred to explicit use of social science user models). These two categories played a central role in the analysis.

Finally, in the third sub-step the investigator tried to identify a common theme for all of the categories, to find a core category (selective coding) and its relations to other categories and perhaps refinement and development of these. See Fig. 4 for an example that illustrates how educational background can be supposed to influence professional network and professional role which again influence the approach to user modelling.

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The fifth and sixth steps in Kvale (1996) analysis model: re-interviewing for improved self-correction by the interviewee, and the interviewee acting on basis of the interview was not compatible with the research question that governed the analysis (the research question was not oriented towards action research or therapeutic change). However, the interview transcriptions were send to the interviewees with a note asking for their comments, if any. In one case (the ‘analyst’), we had a discussion with the interviewee on basis of the transcription, which was hereafter revised accordingly.

4.6. Verifying

Different checks for the reliability of interviewing, transcribing and analysing the interviews were conducted. Firstly, as a check for interviewer reliability, we read, heard and saw all interview notes and recordings again and compared these with the interview guide to ensure that all questions were fully covered in similar ways, i.e. that not one of
the interviews were affected seriously by non-relevant issues like the investigators (my) mood of the day or the social atmosphere of the interviews. In particular, it seemed important to check whether variations in interview locations, which spanned company office to home office settings, have had an effect on the time given in each interview to the different modes of conversation. Besides some additional pauses in home settings—the interviewee serving coffee, etc.—no differences were obvious. Secondly, as a check for transcription reliability, the edited interview was as mentioned above send to the interviewees, who did not disagree with the transcriptions received. Thirdly, as a check for analysis, the coding was repeated after three months and revisions carefully done. Fourth and finally, as a way to counteracting eventual biased and selective interpretations we discussed the coding and interpretations with members of the research group at my institution and with members of the target community. From these discussions it became apparent that at least one (the bridge builder) of the four HCI Professional types we propose also have been found in an engineering design community (Munch, 2003).

The arguments for the validity of the findings presented in next section were as follows. Firstly, we controlled for how representative the four interviewees were of the HCI Professionals in the target community (a Danish HCI community) by comparing them with a list of the community’s members and their educational background. As a way of controlling for researcher effects by triangulation of methods, we did a small consultant project together with two of the interviewees and had here the opportunity to observe how they applied different, and from the interviews predictable, approaches to user modelling. With the third HCI Professional, we discussed ways of doing usability work—he held training courses in his approach. The fourth HCI Professional had an extensive homepage in which he explained in detail his approach to usability. Furthermore, we compared the four HCI Professionals’ types with results from a study of HCI education at different Danish universities and the theses written there, and found systematic differences between HCI Professionals coming from different universities that matched the four types (Clemmensen and Leisner, 2002).

Secondly, we investigated rival explanations. One possible alternative to the psychological explanation that we have chosen to discuss below in the discussion section was a social network explanation: Differences in user description paradigms might be solely related to differences in the professional’s social networks. In the cases investigated, it appeared (as expected, see Fig. 1) that the HCI Professionals’ networks mirrored their educational backgrounds, so the network was perhaps an integrated part of the professionals’ personal backgrounds, rather than an isolated explanatory phenomena. Another alternative explanation was that differences in user modelling were related to the different products that the HCI Professional’s companies developed. For example, instrument design could require a user modelling approach that is different from the one that is sensible for website design. However, the interviewees in the investigation had crossed company/branch barriers and developed user descriptions for different products, so differences in approaches to user modelling were not easily explained by branch or product differences.

Finally, we discarded the relations between the four types of HCI Professional’s in terms of their contacts to each other’s educational environment. Again, these relations
between different HCI Professional’s educational backgrounds might be important moderators for any differences in user description practice, but from this study we cannot know.\(^2\)

With the method used in this study, it is easy to come to think that the ideal types of HCI professionals are specific, real (or fictitious) individuals, which they are not. They are abstractions constructed to analyse HCI professionals’ approaches to user modelling, and the results should not be interpreted as specific individual’s approaches (not even by those of us who personally know the eight interviewees and their work).

5. Results

The results of this study shed light on four effective approaches to user modelling in practice and give hints at what works and what does not work in a system development context. First, the ‘analyst’ approach conceptualizes the user as one or more abstract personality—dimensions with the purpose of creating ideas among creative graphical designers and graphical programmers. Second, the ‘designer’ approach models users as characters in need of information with the purpose of creating an image of the users in the head of customers. Third, the ‘programmer’ approach conceptualizes the user in data to be shown at the computer display, with the purpose of optimizing structured design proposals. Fourth, the traditional ‘bridge builder’ approach describes the user in terms of his or her tasks, with the purpose of evaluating prototypes and removing usability problems. All the approaches to user modelling thus involve some degree of abstraction. Their effectiveness depends on the accuracy of the techniques applied with respect to the purpose of the approach.

The following paragraphs discuss user conceptualizations from the perspective of each type of HCI professional. Table 1 relates each type to the conceptualization of users.

5.1. The ‘analyst’ approach

The ‘analyst’ describes the user’s personality as an abstract and poly-dimensional character, with a clear structure of parallel and independent scales. The goal is to provide creative people (graphical designers or programmers) with a foundation for an idea that can be the basis for design of websites and other elements in the communication with users. The analyst’s synthesis work cannot be restricted to a traditional description of the users needs, but lies in the description of the personality. The abstract character of the analyst conceptualization of the user is illustrated in the following segment from an interview. Elsewhere in the interview, the interviewee has told about how it is for him to be the responsible for HCI in a company that sells market analytic services, how users also are customers and consumers in his approach. Now he explains his approach to modelling users in more detail:

\(^2\) We did not do any if–then tests. A possible candidate for such a test would be to provide all four types of HCI Professionals with a description of users and ask them to rewrite the description and to assess what information was needed. This should then be systematically different. However, this is for future research.
In the presented interview segment, the interviewee argues against using one ‘functionality dimension’, e.g. an ‘internet navigation’ novices-expert dimension. Instead he argues on behalf of using the many dimensions of the personality of the product, as the user will see it. The user and the product are always involved in a communication process, the interviewee points out, and in this communication the personality dimensions appears to a varying degree.

An abstract description of user personality, instead of specific user requirements, becomes therefore necessary because the analyst wants to give creative people (graphical designers or programmers) a foundation for an idea instead of a particular design. The idea then constitutes the personality and becomes the basis for design of websites, ad campaigns or other elements in the communication with users. The analyst’s conceptualization of the user therefore needs to have an abstract and poly-dimensional structure with degrees on parallel and independent scales, or, if the coherence is better defined, on orthogonal scales locating the personality in a spatial system. Furthermore, this abstract poly-dimensional approach to user modelling is traceable to, though perhaps not fully explained by, the kind of theory preferred by the ‘analyst’. For example, the following segment from an interview illustrates some of the possible intellectual references for such an approach to user modelling:

“…Activity Theory, you know that, don’t you…Zen Buddhism…Disruption theory, that is more than just an advertising method…”.

In this segment, the interviewee explains his basic approach to reality that consists of a mix of the social-psychological approach of ‘Activity Theory’, Zen Buddhism and the advertising and communication approach of ‘Disruption theory’ that can be used for creative design of branding efforts on companies’ web sites. The analyst approach to user modelling thus consists of personality dimensions, not free-floating ones, but some that are rooted in a mix of ideas that not all belong to the scientific domain.
5.2. The ‘designer’ approach

The designer models users as concrete characters or small figures, who need information and work their way through the interface in several phases. On their way, the characters change, their needs for information change and the interfaces change. The goal is to create an image of the users in the heads of the customers and the means to do that are tales of particular users’ walk through the interface, given in everyday language and closely related to the interface.

The ‘designer’ builds users as models, characters or small figures, which are similar to real flesh-and-blood people with lots of details and a rich environment. The reader should be able to empathize with the users. There are several chapters or phases in this kind of work. In each phase the characters change, their needs for information change and the interfaces change. The ‘designer’ describes the phases in users’ experience with the interaction, by applying markers from the users’ stories, such as “…before we…”, “…just when we had…”, “…when we got acceptance…” and “…by the end of…”. Such markers are used to present a story that allows other people to imagine how the users see their use of technology. This is illustrated by the following segment from an interview: “…I want to create a picture of the users in the heads of the customers”. The interviewee refers to a nearly physical object created in the head of customers, those who pay the HCI professional. Thus there are no theories of the human user that function as cornerstones in the ‘designer’s’ conceptualizations of users, because the focus is not on the representation of users, but rather on the communication of user—figures to the receiver, the customer.

5.3. The ‘programmer’ approach

The ‘programmer’ conceptualizes the user in data he or she wants to see in screen fields. He or she does not establish what the user is supposed to do, but instead do an analysis of design proposals with structured methods. The goal is to develop new methods and tools (data models, interface anecdotes, etc.) and these data models are not designs, but serve to conceptualize the user as a part of the interface.

The ‘programmer’ works close to the conceptual design. He describes the user in terms of the data a user binds to a concept in an interface. This approach is illustrated in the following excerpt from an interview:

“…the products [that I deliver]…are conceptual design, documented in user data models. There is one formulary per concept, and it shows the information that a user associate with the concept and provides the names for fields, so you get a first design tool…”.

In this interview fragment, the interviewee explains how the user data models are developed as design tools. The interviewee has used this approach to design web pages and interfaces to instruments. The ‘programmer’ thus conceptualizes the user by applying user data models that helps him or her to formalize the user in a formula with names of screen fields and the data a user wants to see in these fields. The user is bound to the interface by these definitions, and become visible indirectly through the programmer’s anecdotes about
interfaces. For example, the programmer tells an anecdote about how the individual keys are spaced widely on keyboards of bank terminals in northern Sweden, and then expects his audience to produce a mental picture of a freezing Swede with large gloves who is trying to retrieve cash from the machine. Though such user anecdotes obviously are important to the programmer, he or she is more interested in theory or theoretical frameworks that include concepts, methods, etc. that comes with the structured approach. The following excerpt from an interview illustrates the conflict between on one hand the need for some theory that may account for the user anecdotes, and on the other hand the interest in structured descriptions:

“...but when you talk to others about it [about theory], very soon somebody says something about windows and flow diagrams—and then there are a big heap to the work analysis...”.

Here the interviewee shares his experience that he and his colleagues feel that there is a gap between work analysis and structured methods. He explains further:

“...there aren’t many who has done research in the empty space between (a) you know what you are going to do and (b) you have the physical user interface design...”.

The interviewee expresses in these two interview fragments that the ‘gap’ between work analysis and physical design need to be bridged theoretically, but that he or she do not know how, except that flow diagrams is valued by everybody.

As indicated by the interviews, the programmer’s point of departure is that design methods and notations for descriptions of concrete design suggestions are valuable. The problem is that it is difficult to establish what the user is supposed to do. A very unwanted situation is when the user does something other than expected by the programmer. The following fragment from an interview illustrates the programmer’s worst case:

“...how do you delimit what the task is, so that the user doesn’t fool around after solving the task, and hence experience the otherwise effective design as difficult?”.

In this fragment, the interviewee asks how to control the user and the user’s experience of the design. The interviewee suggests that if we know how to delimit the tasks that the user has to perform with the design proposal, then we can control the user. The programmer defines the user: he analyzes the design proposal (and the tasks related to that design) from a logical point of view. The logic is part of a chosen structured method, and the programmer wants to apply and develop this and similar methods. With this aim, the programmer creates tools (data models, interface anecdotes, etc.) that are not real designs, but serve to conceptualize the user as a part of the interface.

5.4. The ‘bridge builder’ approach

The bridge builder describes the user in term of the tasks, the user has to do. The goal is to get developers to think and talk about user’s work situation and to get users involved
and the descriptions of users are relevant for requirement specifications and design of prototypes. The bridge builder preference for tasks goes beyond only paying attention to certain things users say and do, and include filters and ways to avoid taking in irrelevant information from the users. The following lengthy excerpt from an interview illustrates this approach to user modelling:

“...HCI [theory] didn’t have our interest at all, what we were interested in, was to get the user to think aloud, in order to identify the problems he or she had...we saw the problems as the users real needs, what was it the user was stopped by...we didn’t care about the color, whether it was red or green, and the occasions were the user felt it should be yellow we left out...the essence was to ask WHY the user felt it should be yellow, and then the user would give us a long presentation, and we could say: AHA, this is the user’s real needs, and end up with a small change in the prototype and writing a requirement specification that actually was consistent with what the user needed...it wasn’t the graphic, not at all...

The interviewee tells from his experience as partly responsible for the design of the user interface to audio measurement instruments manufactured by his company. In the interview fragment, he goes to some length to point out that he is interested in the users’ needs, which he identifies as what stopped the user and the users’ explanations of these barriers. He also points out that the end goal is to write a requirement specification consistent with the user’s need.

The fact that the bridge builder’s descriptions of users are directly relevant for system development has an ideological aspect. This is illustrated by the following fragment from an interview:

“...the philosophy is to get the developers to think of and talk about the users’ work situation...”.

The interviewee here explicitly states his philosophy that is oriented towards system development practice. For the 'bridge builder', user involvement in system development is important, but applying HCI theory about users is not at all of interest. The bridge builder prefers to learn from practice, or to teach others. Should some expert be important, the expert should have an impressive track record of usability work and written guides for practitioners that has been sold in a large number of copies. Even without applying HCI theory, however, it is possible, according the bridge builder, to get close to users, to spy on them and to observe what hinders the user in achieving his or her tasks and to ask for the users’ explanation of the problems. Therefore, he or she prefers to be humble towards the users’ world. This approach towards user modelling is illustrated in the following fragment from an interview. The interviewee warns against HCI professional’s typifying of users on basis of personal experience:

“...NN has reached a situation where he now thinks that he has talked to so and so many users and now knows what is good and bad about web design...it happens for all of us, but someone like me encounters sometimes a new product or a new domain, of which I
know nothing...that’s why I have to be humble, to learn all the time...of course I do know something about buttons and lines and so on...but what the user needs I have to do a test to clarify...”.

The interviewee in the interview suggests that HCI professionals always have to do an empirical test in order to identify users’ needs. Thus illustrated, from the perspective of the bridge builder it is, as a matter of principle, impossible to understand the users beforehand. The users live in endless many different worlds. They should be asked to participate in tests, with which the HCI professional can investigate specific solutions to specific problems in task performance. The results of the test are then to be regarded as the users’ real needs. Through these investigations of the users’ real needs, the bridge builder defines the set of functional requirements that are needed to transform the user to a new and improved world. This is illustrated by a fragment from an interview with the same HCI professional that is cited above: “… my approach is to transform the users’ world forward to the next generation…”. The interviewee here is clear about his own role in changing the users’ lives. In the new worlds, consisting of new interfaces, the users report fewer problems with performing his or her tasks.

6. Discussion

We discuss the findings and the differences between approaches to user modelling in this section.

6.1. Comparison with previous research

Is there a best way to classify users? If there is one, what is it? In our study, it was clear that it was not a lack of skills, methods or techniques, which caused the differences in approaches to user modelling. The interviewed Danish HCI professionals certainly had proved earlier that they were able to proficiently use tools for analysis and presentation of end-users in system development. Instead, our interview study supports a view of HCI professionals as having systematic different approaches to user modelling that are related to their own personal background and professional network, but independent of their organizational context and current projects. That means that even HCI professionals in same job positions within same company working in the same phase of system development may differ systematically in their understanding and interpretation of the future users of the system to be designed.

This situation is perhaps different from earlier situations. Back in 1986, when the question of ‘a best way’ to classify users also was raised (Potosnak et al., 1986), practical classifications of users were perceived as being mostly based on the novice/expert dimension, and concerned with the user’s experience (interaction frequency) or time spent with the system. Based on the recognition of the paucity of these schemes, researchers eventually came to agree that perhaps it is not useful to classify users at all, or at least that the usefulness of user classification depends on the kind of system to be designed (Potosnak et al., 1986).
More recent studies propose that professionals develop and apply complex, multilayered, views of the human user in system design and product development. A recent study of the acquisition of design expertise showed how the system designer’s contextual knowledge of the end user is an important constraint on the use of system development methods (such as interactive prototyping) in practice (Etelapelto, 2000). The designer’s articulation and respect for user constraints, e.g. usability constraints, have also been shown to be related to pre-scribed client constraints and design expertise (Chevalier and Ivory, 2003). In both cases, expertise in applying some particular method in system development was related to the designer’s approach towards users (and clients). Isomaki (2002), who studied Finnish system designers, found 18 different conceptions of the human user prevalent in system design, and three different forms of thought (separatist, functional, holistic). She suggested that there is an educational need to provide designers with an understanding of human behaviour, together with methods and tools that allow them to build humanised IS. An educational approach that change the thinking of professionals was also the suggestion that came out of Meister’s (2004) study of 72 US Human Factors professionals’ conceptual structures. He saw the major function of a professional’s conceptual structure as functioning as an overall framework within which customary measurement practices can be fitted. However, the professionals in his study were not aware of their conceptual structures; they could not describe their own approaches as different from other professions or sciences, e.g. psychology and a substantial minority did not even agree that the human relation with a system was the distinguishing factor for their professional approach (Meister, 2004).

Our findings and interpretations from the interview study are in line with these complex and layered views of how the human user is represented in system design. Furthermore, as a thought experiment, we could imagine that a user modelling method, e.g. the ‘persona’ method, would be applied in a small scale project by HCI professionals with different backgrounds. Our interview results suggest that the use of this method for user modelling would provide different results if it was used within the analyst approach, instead of used within the designer approach. In the former case, focus will be on abstract, mental dimensions of the user/product relation, in the latter case, focus will be on the narrative about the user that can be told to the customer. The answer to the question of the performance of different user modelling methods depends not only on the choice of user modelling method, but also on the professional’s approach to reality.

6.2. Differences between approaches to user modelling

Have we basically just showed that the analyst, designer, programmer, and bridge builder play certain roles in the design process and that those roles influence how they structure the data they collect? Can their selective organisation and analysis of data be better explained by looking at the context of their work than by examining their training background?

It is true that we have confined the analysis to the thinking of the HCI professionals, and that they apply interpretations and interpolations in their thinking about users. However, they do this differently depending partly on their training, professional network and individual way of understanding other people. This view of different practices for
understanding IT users professionally is not, we believe, a (hardly surprising) result of considering system developers' roles or organisational context. In a often cited study of system development, Hirschheim and Klein (1989) showed how there exists different system development paradigms that are largely implicit and deeply rooted in the developers’ web of commonsense beliefs and background knowledge. These paradigms serve as implicit “theories of action” and they are ‘in fact, archetypes—highly simplified but powerful conceptions of an ideal or character type” (Hirschheim and Klein, 1989, p. 1202). These archetypes are reflected in stories that play important roles in conveying the essential differences that exist in alternative conceptions of, and approach to, systems development. The different ‘paradigms’ in the Hirschheim and Klein model are probably—but this is guesswork—of a similar kind as the different approaches to user modelling that we describe. Like the paradigms support system development processes, the approaches towards reality—in the form of conceptual structures, forms of thought, mental schemata, belief systems, etc.—help the HCI professional to flesh out the details of their user models and also to focus how they apply the user modelling methods. Hence, the four approaches to user modelling studied in this paper provides what is needed to understand the relation between explicit user modelling methods and the HCI professionals’ approaches to reality: namely an understanding of the person-bound, consistent approaches that can accommodate what is often seen from the outside as inconsistent and theory-free ways of practicing user modelling.

On a psychological level, differences in professionals’ approaches to user modelling can be explained by evoking the well known social psychological concept of social schemata. Schemata helps a professional to pay attention to a few, important pieces of information about a person, situation, event or sequence of events, etc. The individuality of a social schema does not mean that HCI professionals do not share schematic conception of users. User conceptions can be ‘cultural models’ that appear both inside and outside peoples heads, i.e. mental and bodily structures that are visible in social acts and speech (see e.g. D’andrade and Strauss, 1996). We may therefore think of HCI professionals’ thinking about users as their application of ‘cultural social schemas’. In general, social schemata can be classified into four types: person schemata, self-schemas, role schemata and event schemata (Augoustinos and Walker, 1995). None of these different schemata would necessarily be exclusive for a single HCI professional, rather they are ways to analyse and understand our information about other people. For example, person schemata are essentially trait schemata that specify prototypical other persons such as the ‘naïve user’. These schemas give the opportunity to answer questions such as ‘which kind of person is she or he? What does he or she wants?’ Such general questions were in our study answered by the bridge builder by filling the description of users with empirical information about particular participants in particular test situations. Self schemas, on the other hand, are experience-based, cognitive generalisations on one self. The analyst in our study considered certain dimensions (e.g. aggressive–submissive) as central for identity in general, and he or she used these dimensions to characterize the user. The designer type, on the contrary, was more enclined towards understanding others by the use of event schemata that describe sequences of events and serve to predict the users’ actions, their shared goals and collective plans. So the difference in focus between the analyst approach (focus on users personality) and the designer approach (focus on users actions) lie perhaps
in the causality embedded by the ‘designer’ implicit use of event schemas in his or her explicit modelling of the user, as opposed to the ‘analyst’ implicit use of self schemas. Finally, knowledge of norms and behaviour in specific role positions in society, embedded in role schemas, may explain the ‘programmer’ detailed, precise, but also somewhat rigid approach to description of user behaviour.

For these approaches to user modelling to work requires that systematic patterns of error, which emerge on this individual level of professional practice, are avoided or controlled.

6.3. Do HCI professionals stereotype IT users?

In our study, the lack of contextual influence on the HCI professional’s approach to user modelling suggests that there is a danger for stereotyping users. In theory, what goes on in the head of HCI professionals may be prone to systematic errors. According to the ‘schematic thinking’ explanation, errors will occur when HCI professionals routinely describe different users of future applications. Schematic thinking will, in situations with cost and time pressures, lead to stereotyping of users.

Probably stereotypic thinking about IT users can happen for a number of reasons. For example, stereotypes makes it easier to ‘perceive the user’ or to ‘believe’ in the user representation (Cooper, 1999, p. 128), it allows the professional to apply stored user descriptions from memory or some other catalogue of his/hers, and it may be a response to the professional’s need for a social identity in the IT development group as the one who always know the users. Cooper give as his example that for a believable representation of a nurse he would pick a woman, even though there are some male nurses (Cooper, 1999, p. 128). A female nurse is just more believable. Furthermore, stereotypes are not only “…beliefs about the characteristics, attributes, and behaviours of members of certain groups. More than just beliefs about groups, they are also theories about how and why certain attributes go together.” (Hilton and von Hippel, 1996, p. 240). Thus the everyday stereotypes that are based on race, gender, etc. and associated with negative emotions and prejudice are different in nature and purpose from HCI professionals’ theories about IT users. For example, professional representations of ‘real users’ that are made on basis of surveys, interviews, etc. may be regarded as more correct and valuable than representations of ‘fictious users’ drawn from the head of the author (Mikkelson and Lee, 2000).

In principle, some stereotypes may reflect more accurately than others ‘real’ group differences (e.g. they are accurate depictions of great differences between two groups in preferences for a product). However, precise stereotypes based on relatively enduring characteristics such as a person’s race or gender have a large potential for error (Hilton and von Hippel, 1996). The potential for error exists probably also for other enduring characteristics such as users’ high level concerns and goals and users’ attitudes and knowledge about the system, task and domains. These characteristics are at the center of current attempts to communicate an understanding of the users to system designers, and it may be difficult in practice to distinguish useful typifications of users from error prone stereotypes. Mikkelson and Lee (2000) for example warns against taking their ‘user archetypes’ for ‘user stereotypes’, which may happen if we on a routine basis apply
predefined user categories. They also tell about that they had some difficulties with design
teams who wanted to stereotype users instead of developing archetypes. Our guess is that
similar experiences await most HCI professionals trying to develop and communicate user
types.

Therefore it is of interest to the HCI community to shed some light on the psychological
mechanisms that allow user stereotypes to be formed and applied again and again, even if
there are only partly or no corresponding differences between user groups. It might not be
that important to discuss why such user stereotypes exist, but rather to study when and how
user stereotyping is applied, and either use it to achieve homogeneity or heterogeneity in
our descriptions.

One method for counteracting unwanted homogeneity in user descriptions could be to
conscious group designers with different life worlds in the same team. Another method to
reduce the danger of stereotyping would be to—analagous to the way the choice of system
development strategy depends on the kind of system to be developed—try to fit the choice
of different HCI Professionals to the different kinds of systems to be developed. Finally,
the conceptualization of IT users could probably be improved by improving professionals
basic and advanced education (Isomaki, 2002; Meister, 2004). With increasing experience
and specialized training, the HCI Professional may be able to suppress his or her intuitive
conception of the IT-user and replace it with other, more suitable IT-user types. The
question of change therefore becomes pertinent; how do HCI Professionals change their
student-level stereotypes of IT-users? One explanation of conceptual change is the sub-
typing explanation that says that information inconsistent with existing stereotypes is
re-categorized under a new subsidiary classification (Hilton and von Hippel, 1996). If a
HCI Professional over time meets different examples of and theories of IT-users, then
subtypes of users replace the general super class of it-competence-end-users and become
user categories themselves. The rich experiences with users thus eliminate or make the
everyday and student level concept of the end-users superfluous in favour of a set of
specialised categories, much as other specialists in other professions develop a vocabulary
for taking about people and objects related to their work. This development could be
supported by specialized training. The training could be done both in terms of providing
more social science theory and in terms of targeting specific stereotypes hold by students
at specific educational institutions or by experienced professionals in their own
subcultures.

6.4. Development of the HCI community’s concept of users

In the western HCI culture(s), IT-users have traditionally been conceived of in
IT-competence terms (Potosnak et al., 1986). These concepts—e.g. the novice and the
expert IT user—are widespread in the global society. However, there are cautions to be
made: user modelling has a larger social context and the taken-for-granted ‘HCI
community’ concept may not fit the local HCI Professionals and their networks. The
identity of the professional group may not be stable and established, and any shortcoming
or lack of explicitness about users may have to do with the nature of the local professional
HCI community. For example, the idea of having a coherent HCI knowledge in a
community as heterogeneous and loosely defined as the Danish HCI community is difficult.
Currently approximately 1000 people, who have very varied job functions, background, etc. and who are working either in industry or academia, see themselves as belonging to a professional Danish HCI community.

The situation can perhaps be compared with what was found in early studies of Danish computer science specialists (Bjørn Andersen and Malmvig, 1978). The research question here was whether Danish computer science specialists could be considered professionals or just a group sharing a professional identity. The investigators found indicators of a professional identity in terms of similarities amongst computer specialists in expertise and attitudes to users, but the computer science specialists far from met the criteria for being a professional group—e.g. their relation to clients was not regulated on a national level. The taken-for-granted 'HCI community' concept is perhaps not well applied on the group of specialists working with HCI (at least not in Denmark).

6.5. Limitations of the study

This study does not provide cross-cultural evidence on HCI professionals’ approaches to user modelling. The analysis of approaches may therefore be specific to the Danish or perhaps northern European region. However, the ideal type HCI professionals used in this study may offer a methodology for studies of user modelling practices in other regions. Recent studies of system designers’ conceptions of users and frames of reference in system development have neglected cultural issues (e.g. Isomaki, 2002; Orlikowski and Gash, 1994). Earlier cross-cultural studies of system designers’ user models classified designers on basis of user models applied and the nationality of the designer (see e.g. Dagwell and Weber, 1983; Kumar and Bjørn Andersen, 1990). However, studies of cultural issues in user modelling practice can benefit from seeing the HCI professional as an ideal type. A typification of the HCI professional will provide an inter-cultural view of user modelling practices that is based on the professional’s approach, instead of being based on the dubious notions of nationality or the user modelling techniques applied.

Acknowledgements

For comments and suggestions to the paper and for interesting discussions about HCI Professionals’ practice, we thank Jesper Holck, Kerstin Rose, Niels Bjørn-Andersen, the HCI group at Copenhagen Business School, and the four anonymous reviewers.

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