Embedding Complementarity in HCI Methods and Techniques

Designing for the "Cultural Other"

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Abstract. Differences in cultural contexts constitute differences in cognition, and research has shown that different cultures may use different cognitive tools for perception and reasoning. The cultural embeddings are significant in relation to HCI, because the cultural context is also embedded in the techniques and the tools that we apply. We lack a framework for discussing what and who we are, when we talk about a person as the user of an ICT system that has to be designed, developed and implemented. As a framework, we suggest a theory of complementary positions that insists on solid accounts from all observer positions in relation to perspective, standpoint and focus. We need to develop complementary theories that embed complexity, and we need to reflect critically upon forty years of dominance by rationalistic, empirical understandings of the user as illustrated in the literature and practice within the HCI paradigm in system development.

1 Introduction

The global digitalization of information and communication processes requires from the world citizens literacy in use of computers. But the majority of the world populations are illiterates, they are not only technical illiterates, but also illiterates in the traditional sense of the word: they cannot read and write. However, the global ICT development largely disregards the problem with illiteracy and cultural differences.

India may serve as an example. India has developed an impressive ICT industry and has a very high level of expertise in software engineering. In addition, India has implemented e-government systems that also address the rural populations. But the Indian population is very large, and the potential users are highly diverse groups, many of which are illiterate. Experiments have shown that a gulf exists between the intended use of a technology and the actual use because "neither Development nor Quality Assurance Process consider Usability from the requirement phase or the pre-implementations phase" (Jani R. and Badave V., 2004) (Singh and Agrawal 2004).

One solution to the problems with illiterates explored by the Indian Government involves setting up electronic kiosks in remote areas and letting the electronic information process be handled by and through a kiosk operator - who may be a local administrator. India is divided into states, a state is divided into districts and districts are divided into blocks. A block may consist of 40-50 villages and a block administrator may be miles away – geographically and mentally – from the individual farmer in a remote village, who wants to ask experts in Delhi about the black spots on his crop. "In India, language, context, culture change in every few kilometres" (Parmaar et al. 2004). The administrator may not know anything of the knowledge field in question, and the expert in Delhi may never have visited the remote area of the remote state in question. Villagers may have no concept nor understanding of computers and networks – and the technology makes no sense to them. The individual "user" becomes dependent upon the operator (Parmar V. S. and Wani P., 2004), and

questions and answers may suffer from having to pass through the administrators. Besides, information is power, and the administrator's role as the gatekeeper of technology, interpreter and handler of information may undermine the intended technological enhancement of democracy, as gate keeping may develop into a very powerful (and misused) position.

Illustration: example of an e-government web site: Rural Planner

This web page may be activated through mouse over. This means that a text bubble will occur when the user/operator moves the cursor over an object on the screen. In this case, he has moved it over the tractor in the upper left hand corner and a text has popped up.

If the user/operator moves the cursor over the tree, several items become visible: people, the health station, a text in a black bubble and a red arrow that points to a menu bar on the right side. The user/operator is asked to key his user id, password and entry (location), where he can choose between district, block, group or village, and then he may select to see rainfall for given periods.

There is a digital divide between those who have access to IT and those who do not, those who can read and those who cannot, those who speak English and those who do not (Yajnik, 2004). Different solutions have been suggested and prototypes developed, e.g. “interactive speech interfaces” (Girja, P.N. 2004) and special navigational assistance such as “signboard system, vocal agents or natural language processing dialogue” (Panwas, V. and Pradeep Y., 2004).

Another solution has been to suggest personalized e-government services, and experiments have been carried out with “personalized services through touch screen kiosks” to the illiterate villagers. But there are problems with “establishing identity of

person and verification" (Katre 2004). In one experiment, potential illiterate users were asked to choose a combination of images, 7 images for their username and another 7 images for their user identity. There was no problem in getting the users to choose among the many different visual images, which differed greatly in style and size. However, a few days later the users did not remember all the visual images, which they had chosen, or the sequence in which they were chosen. In another experiment, villagers who were unfamiliar with computers were unable to use the keyboard despite careful instructions. The researchers concluded that the users' perceptual-motor skills were not developed to handle small keys on a board. Can one touch and interact with something in a meaningful way if the object and the actions do not make sense?

1.1 A cultural bias

A main problem seems to be the relation between the culture of Information and Communication Technologies and the cognition of everyday life. The villagers had no problems reflecting on rain, clouds, grey skies, sun, etc. in concrete experiences from everyday life. But when these objects were transformed and visualised on a computer screen, they did not recognize them and were unable to talk about them when interviewed. They were visualised, but still abstract - not concrete experiences like seeing the black spots on the crop. " We do not exactly know the information need and information seeking behaviour of the rural populace" (Singh & Agrawal 2004), and we do not know their reasoning on or perception of the ICT applications, to which they are introduced. This may be difficult to understand for academics, because abstract concepts and meta-reasoning are so fundamental in our professional lives. But reasoning and thinking based on the concrete experiences from everyday life cannot capture the meta-reflections embedded in the world of ICT applications.

Context is embedded in cultures, and differences in cultural contexts imply differences in cognition (Barry and Dasen,1974). This understanding has to be taken one

step further as research shows that cultures may use different cognitive tools for perception and reasoning and there are culture specific differences in the way that people think and reason (Nisbett R., 2003). A logically true statement may be true in English, but not in Hindi, or Chinese.

The cultural embeddings are significant in relation to HCI, because the cultural context is also embedded in the methodological framework, and in the techniques and the tools we apply. The HCI field fails to consider the role of culture in its methods and techniques (Smith A. & Yetim F., 2004), but they cannot escape a cultural bias. Traditional HCI methods and techniques have developed along with the IT industry and are based on western thinking.

2 Representation of Users

In computer applications, designers have long used representation of users. A recent example of the representation of humans can be found in Microsoft OneNote ®[1] software, where users are represented by portraits (photos) in usage scenarios know as personas (Mikkelson & Lee, 2000; Nielsen Lene, 2002; Pruitt & Grudin, 2003): On OneNote´s Danish website, Kirsten is a consultant, Søren is an engineer and Kathrine is a student, who takes notes in English although she is a Danish student. On the German site, she is named differently, but the photo and task are the same. The diversity of people's skin colour in the different usage scenarios shows that the company addresses "equity issues", but it applies usage scenarios with an embedded representation of users as mono-cultural and function-oriented ideal types. Thus, we are all on a global scale exposed to descriptions of a limited number of ideal humans who apply technologies in certain ways and are blind to cultural differences and illiteracy.

Not even the representation of the user in the traditional Human-Computer Interaction (HCI) techniques and methods reflects a complex and differentiated understanding of

human beings. In most of the Human Factors' representations (Baecker, Grudin, Buxton, & Greeenberg, 1995; Dix, Finlay, Abowd, & Beale, 2004; Lindegaard, 1995), it is not a person who is represented, but computer applications with a one-dimensional user as an appendix (Card, Moran & Newell 1980, Nielsen Jacob 1992, Nielsen, Clemmensen, & Yssing 2002). Despite conscious and explicit attempts to get around the one-dimensional human being, even the new interaction design research (Preece et al., 2002) ends up with a simplified, rational subject, and interaction remains something that takes place in a closed space: within the human head. When Human Factors as well as Interaction design focus on tools, techniques and methods, they do not have a clear understanding of the underlying theories, and hence they cannot frame the use of tools in the embedded world views.

3 A challenge to HCI

The challenge lies in developing more diverse representations of the complex human being in an information and communication technological (ICT) perspective. Inadequate descriptions of humans are decisive for the designer's conception of the user and will eventually govern the development of the user interface (Kumar & Bjørn Andersen 1990). Hence, they also have an impact on the user functions designed as part of the systems, and they influence the human-computer interaction - and the human beings that use the systems (Levinsen, 2003). As such, the designers' user representations influence our conceptions of what humans are and what computers are, and therefor, they also influence our imaginations about the future society as a whole (Weizenbaum 1976, Winograd & Flores 1988). Besides, the inadequate descriptions of users do not enable or support the design of a future ICT that is oriented towards humans as individual users in other cultures and contexts than the standardised work and mass consumption culture.

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[1]Microsoft.com, (retrieved Jan. 21 2004), http://www.microsoft.com/office/one-

We lack a richer and more complex description of who we design for and what they will do with our designs. We lack complementary methods and techniques to develop complex descriptions of the future systems' users, and we lack methods and techniques to develop complex user centred designs, tests and evaluations (Karat & Karat 2003). Our claim is radical: We need to develop complementary theories that embed complexity, and we need to reflect critically upon forty years of dominance by rationalistic empirical understandings of the users expressed in most of the literature and practice within the HCI paradigm in system development.

4 A floating context

Users do not identify with – and cannot be identified from a traditional demographic categorizing of sex, age, profession, etc. We are immersed in different cultures and take on roles and functions depending on which contexts we enter into and are co-creators of. This also applies to cooperation and communication technologies. We may play with our identity in chat rooms; we can cooperate with colleagues via the net and then, a few minutes later, log in and be a student in a virtual master study programme. However, within ICT the representation of the human has been based on a rational ideal that is goal oriented, information seeking and task directed (Ericsson & Simon 1984, Levinsen & Ørngreen 2003, Lewis, Nielsen & Yssing 2003). Quantitative segmentations have played a major role, and because computers were developed for standardised work (e.g. text editing) and mass consumption, the human had to become someone who could adapt to each new generation of software, instead of the other way around. It still characterizes computer use (except for front users) that humans have to adapt. At the same time, however, ICT is spreading into people's everyday life and all other aspects of life, both in specific, personal ways and as general, cross-personal globalization. As a consequence, technologies will have to work in ambient contexts defined by the different ways and areas and the different uses. The context becomes *floating*: I am physically present at my office, in my chair, and,

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note/prodinfo/usage/journalist.mspx

at the same time, I am present on the net, virtually present in Bangalore, walking down the 'MG road' deep into discussion with an Indian colleague, sensing the noise from the traffic, the chaotic street, the multicoloured flower-arrangements in the many small shops – and aware of the two students who enter my office and place a book they want to return on my desk.

5 Perceptual Interaction

The children of today will be the power-users of tomorrow. They are emotionally engaged and develop new cognitive skills (Nielsen, 2003). Without efforts, they navigate deeply into the application and transfer to other applications, all the time having an overview and knowing their way "home". In this development, we find a challenge for research. The interaction with the computer is mental. The computer interacts directly with the human cognitive processes: perceptual, emotional, sensual and conceptual. Hence also the sensual, visual and emotional interaction, which relies on tacit processes (Nielsen, Christiansen, Clemmensen, & Yssing 2003) and takes place above, around and below the verbal and written interaction, becomes significant. But how do we create and communicate this knowledge about humans' use of technology? How do we use these creations to design software and interactive products? It is not only the goal directed interaction we need to understand, design and evaluate, interaction also embeds aesthetics and pleasure (Jordan, 2000). Irrespective of the technological goals, the intentions with "pervasive, ubiquitous and transparent computing" (Weiser, 1998; Weiser & Gold, 1999) are identical: Technologies should be "unobtrusive", i.e. we should not focus on the technology, but on the activity we are currently doing.

We suggest that HCI research should contribute to the design of future ICT systems by focussing on (1) culture and floating contexts (2) the double complexity of complex roles and functions and (3) the cognitive basis of the interaction with the computer.

The research challenge lies in conceptualizing and representing the complexity and represent it in the methods and techniques for analysis, design, test and evaluation of human-computer interaction. The conceptualization of research objects is all framed by culture through its embeddedness in our understanding of humans, theory and technology. To analyse this complexity, we need to apply a theory of complementary approach.

5 A complementary methodology

The cultural frame, the complex human being, the floating contexts and the mental interaction cannot be described from one single observer position. They may eventually be described and presented in a richer diversity by combining many observations from many observer positions. What we need is a framework for discussing what and who we are, when we talk about a human as a concrete user of a concrete ICT system that has to be designed, developed and implemented. As a framework, we suggest a theory of complementary positions, which insists on solid accounts and theoretical explanations from all observer positions in relation to perspective, standpoint and focus. The framework enables us to relate to the observers' influence on the observed aspects (Allen, 1959) and the limitations encountered by culture and language(s), when the subject-object distinction cannot be maintained.

Adopting a theory of complementary positions as a framework necessitates an experimental approach. This allows the representations of the Human in HCI design methods and techniques to be tested and developed in iterations during the whole development and use process. As a point of departure, we have developed the figure below. The model shows examples of areas, within which different types of human representations are needed. They have to be further investigated, both on the level that concerns one technique within one phase of the system development, but also on the level of methodological approaches to ICT across the whole development process and user cycle.

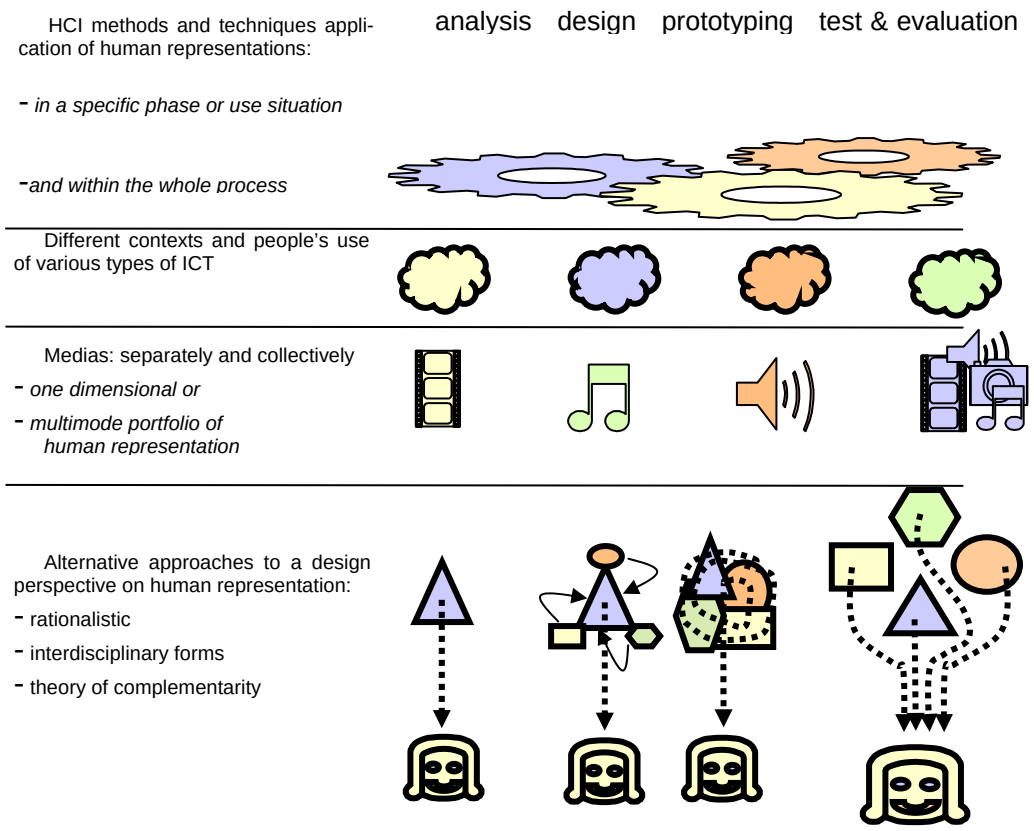

Figure 1. Context sensitive HCI design methods and techniques based on an experimental approach.

6. Future work

As the complexity of the Indian scenario has shown, highly creative approaches to development from a user perspective are necessary. We have to reveal cultural biases embedded in IT applications and must have an open mind for development of HCI methods and techniques as well as new applications. But the design and development need to be based on experimental sketches and prototyping, just as techniques and tools for test and evaluation of human interaction with the computer/other ICT artefact have to be developed on an experimental basis. Confronting existing techniques and tools, e.g. contextual enquiry, cultural probes, scenario development, the technique of engaging persona, iterative prototyping, design of icons and graphical (dynamic) interfaces to applications with explorative and experimental approaches, may lead to innovative designs.

Our design approach attempts to integrate a focus on analysis and design that goes beyond the general reliance on iteration as a way to develop products that fit the user's needs and context. In a period with flexible, mobile technologies used in drifting contexts, it is vitally important to maintain a focus on users and the complex user situations. As society and users' work become increasingly complex and global, we believe complementary techniques resulting in multidimensional user descriptions may lead to a focus on a robust and diverse user approach, for example by means of extensive work studies providing multidimensional rich portraits of users.

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