Then the Picture Comes in Your Mind of What You Have Seen on TV

A Study of Personas Descriptions and Use

Nielsen, Lene

Working Paper

Proceedings of the 5th Danish Human-Computer Interaction Research Symposium

By

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PROCEEDINGS OF THE 5TH DANISH HUMAN-COMPUTER INTERACTION RESEARCH SYMPOSIUM

Copenhagen, Denmark
8 November 2005

Edited by

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PREFACE

Copenhagen Business School is happy to host the 5th Danish Human Computer Interaction Research Symposium. The aim of the symposium is to stimulate interaction between researchers from academia and industry through oral presentations and a keynote presentation.

We received 17 paper contributions for the symposium, of which 14 were presented orally in four panel sessions.

Previously the symposium has been held at University of Aarhus 2001, University of Copenhagen 2002, Roskilde University Center 2003, Aalborg University 2004.

Torkil Clemmensen & Lene Nielsen

Copenhagen, November 2005

CONTENT

INTRODUCTION

Copenhagen Business School is happy to host the 5th Danish Human Computer Interaction Research Symposium. The aim of the symposium is to stimulate interaction between researchers from academia and industry through oral presentations and a keynote presentation. The focus of the symposium is on HCI research, e.g. usability work, novel interfaces, web design, affective computing, psychological models, computing in music, creative arts, design, architecture, support of collaborative and mobile work and life, e-business, e-government, e-learning, e-health, e-agriculture, speech input, information navigation, design of input devices, visualization, and home computing. Reflections on and challenges of HCI work based on industrial experiences are highly welcomed as well.

The HCI group at Department of Informatics, CBS focus on how cultural differences might affect methods and studies. Therefore we are happy to welcome professor Pradeep Yammiyavar from the Indian Institute of Technology, Guwahati, as keynote speaker. The keynote will give an understanding of emotions and their potential from the HCI perspective. One particular unexplored area for HCI is cross-cultural issues in designing and testing of computer based processes. The question is whether underlying emotions can offer a better way to understand cross-cultural issues.

DHRS 2005 – CONFERENCE PROGRAM

0845 – 0915 Registration and coffee

0915 – 0930 Welcome

0930 – 1030 Keynote speaker
Professor Pradeep Yammiyavar, Indian Institute of Technology, Guwahati:
Emotion as a construct in HCI

1045 – 1200 Panel session 1 – Bringing out new design
Chair: Rikke Ørngreeen

- Anne Marie Kanstrup & Ellen Christiansen: Designing Games – balancing fun and seriousness
- Rune Nielsen: Traps & Triggers – Design for Discussion
- Kim Halskov Madsen & Peter Dalsgård: Early Experiences from an Inspiration Card Workshop
- Søren Jakobsen: Fasttrack Scrolling: A Faster and More Satisfying Scrolling Interface for Web Browsers.

1200 – 1330 Lunch

1330 – 1445 Panel session 2 – User studies and context
Chair: Karin Levinsen

- Anders Toxboe: Using personas to guide iterative development
- Lene Nielsen: "Then the picture comes in your mind of what you have seen on TV" – a study of personas descriptions and use
- Gitte Skou Petersen: Dealing with reality
- Rikke Orngreen, Torkil Clemmensen, & Annelise Mark-Pejtersen: A new IFIP working group – Human Work Interaction Design

1515 – 1630 Panel session 3 – Domain and design
Chair: Janni Nielsen

- George Strøm: Classification of descriptions used in software and interaction design
- Olav W. Bertelsen & Pär-Ola Zander: Obstacles to Design in Volunteer Based Organisations
- Karin Tweddell Levinsen: Process Management Tools in Higher Education E-learning – a new HCI Research Area
- Eva Brandt: From handicraft school to design university

1700 – 1745 Panel session 4 – International research in usability evaluation
Chair: Torkil Clemmensen

- Als, B., Frøkjær, E., Hornbæk, K., Høegh, R., Jensen, J., Nørgaard,M. Skov, M., Stage, J. & Uldall-Espersen, T. :The USE Project: Bridging the Gap between Usability Evaluation and Software Development
- Janni Nielsen: Designing for the cultural "other" – A global perspective on HCI and illiteracy

1745 – 1800 Closure

1800 – 1830 Guided tour to the new CBS

1900 – 2200 Dinner

ABOUT THE KEYNOTE SPEAKER

Pradeep Yammiyavar [*ya'-me-a'-var*] has donned the roles of an Industrial Designer, Engineer, Scientist, and Teacher during his career of 21 odd years in the profession of Design.His academic specialisations are in Product Design, Product Engineering and Management. He holds a B.Tech in Civil engineering and an M.Des from IIT Bombay in Product Design. His work on Emotions as Semantic Constructs, earned him India's first Doctorate in Industrial design from the Indian Institute of Science, Bangalore where he also worked on the Faculty as Principle Research Scientist and headed the Industrial Design group. He established the M.Des program at Indian Institute of Science, Bangalore before joining IIT – Guwahati in 2002 as a Professor.

His research areas include Product Semantics, Consumer Behavior, Design Management, and Usability Engineering. He has taught a wide range of subjects in Industrial Design and Product Engineering to Graduates, Postgraduates and Research Scholars studying in India's best Technical institutions. In Design pedagogy his interests are in the areas of Product design, Product Engineering, Instruction Design, E-Learning, Cognitive Sciences, Usability Engineering, Interaction design and Transportation Design.Prof. Pradeep Yammiyavar has been an Industrial Design consultant to industries in the areas of Product design and Engineering, Graphics, Transportation Design, Exhibition Design and Environment Design. His clientele includes corporates such as INFOSYS, SASKEN, Featherlite Industries, Ponds (India), TVS group, DASSG (Swiss) to name a few. He has been a Design advisor to the state Governments of Karnataka and Kerala. He has worked on international projects in Europe and Thailand. He holds a total of 9 Intellectual Property Rights and has over 25 publications in Journals and International conferences proceedings. He has convened National and International conferences. Besides being on editorial committees, he has been invited to deliver key note addresses at International symposiums and workshops.

Prof. Pradeep Yammiyavar has been awarded the Swiss Government Fellowship twice during which he has worked in European Design Studios and conducted research in Universities in Switzerland & UK. He has been honored by the Government of Thailand, won an ICSID prize in Japan and has been a recipient of the Indian Institute of Technology, Bombay -IDC Distinguished Alumni award. He advocates and practices the paradigm of 'Creativity - Innovation – Invention – Technology' within Design.

EMOTION AS A CONSTRUCT IN HCI

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ABSTRACT

This paper intends to look at the potential of Emotions and their role as constructs in HCI under three broad headings namely (a) Humans and Emotions, (b) Computers and Emotions (c) Interactions and Emotions. Though emotions have been centre stage of affective computing they have not been explored in HCI for their capability to enhance the quality of interaction. The application of emotions in computers is at the moment confined to graphic user interfaces. The user is the focus in HCI and emotions help in understanding the user better, both as an individual and as member of a community. How emotions can become constructs to measure collective minds, given a cultural context, is explored. Importance of studying commonalities instead of differences in cultures is put forth. Results of an experiment to find out the extent of commonalities between two cultures in responses to emotions are used to illustrate the extent of commonalities shared between cultures at the emotional plane. HCI researchers are being asked to resolve usability issues at the cross cultural level on the planes of artistic, aesthetic and social experience of the user. Usability testing often involves interpreting culturally dependent variables. The possible role of emotions as additional validates especially in cross-cultural testing is explored. It is posited that dimensions based on emotional thinking mind are better indicators of cultural coherence amongst individuals making up that culture. Computers' increasing role as social and cultural change agents will necessitate new interaction design paradigms and this is possible by studying emotions at the culture level. The role of the computer is envisaged in this paper as a reflector, diffuser and deflector of emotions. This paper intends to highlight the potential of emotions to formulate a new framework in HCI, eventually leading to the establishment of Affective Engineering.

INTRODUCTION

We all acknowledge the pervasiveness of emotion in every aspect of our lives. HCI is no exception. There is surfeit of e-motion hidden in the H-C-I relationship. Where ever there are humans - (H) so will there be Computers -(C) and where they both are present, they will interact-(I). Should the interaction be computer-centric or human-centric is the question facing an HCI specialist. The response is as simple as the question - human-centric of course.

When the same question is restated as how much more should the computer be made to behave humanlike or how far should a human learn to adapt to the computer and how to go about doing it - the answer is not simple. While philosophers like Penrose, Searle, Simon, Shannon and Hofstadter debate about whether computers will attain consciousness to rule over us or not, a group of specialists under AI are busy making a computer talk, behave and interact like a human. Another group of specialists from disciplines of Ergonomics, Cognitive sciences and Design stress on Usability and advocate the human being as the centre. HCI specialists need to interact with both the groups, one of whom is logic-centric and the other human-centric, while being paid by yet another group that is interested in making and selling more and more computers. Instead of having sentiments about which of the three groups to join, HCI specialists could be better off pursuing the science of sentiments.

Dylan Evans (2001) calls the study of emotions as the science of sentiments. At the rate of which constraints of technology are disappearing, emotions are the only difference distinguishing man from machine – humans from computers. HCI specialists are increasingly becoming emotional about emotions in HCI going by the number of workshops and conferences subsections recently announced. (HCI 2005 Edinburgh, UK; ISRE 2005 of the Geneva emotion research group; Emotion in HCI Workshop of the Fraunhofer Institute of Computer Graphics, Germany, ACII2005 Beijing and similar others announced all over the world).

This paper intends to look at the potential of Emotions and their role as constructs in HCI under three broad headings namely (a) Humans and Emotions, (b) Computers and Emotions (c) Interactions and Emotions.

HUMANS AND EMOTIONS.

One cannot exist without the other. Creatures without Emotions would have no reasons for living or for that matter for committing suicide stated Elster Jon (1999). Emotions are the most important bonds that link us not only to

others and us but also to our environment. Watson's behaviorist school of psychology, influenced by objectivity-governed science, had kept out emotions claiming that they were after all subjective phenomena. Humans trying to understand other humans lead to a complex situation where there are as many resultant 'understandings' as there are humans. A possible way to reduce the complexity is to try and understand humans through their underlying emotions. Emotions do hold potential of becoming a framework for achieving synchronicity not only between humans but also with computers. While emotions are universal, each human being has an emotional profile that is unique. Similarly it is envisaged that each computer can be made to have its own emotional profile. In other words vesting computers with emotional intelligence offers a fertile research ground for HCI specialists.

What constitutes Emotion

Aristotle (384 BC to 322 BC) laid the foundations of European psychology of Emotions. His most fundamental insight was that emotions are connected to actions. Rene Descartes in his book – The Passions of the soul- laid out the basis on which modern neurophysiology is based on. Descartes gave an account of six fundamental emotions namely wonder, desire, joy, love, hatred and sadness along with their physiological results on the body. Descartes described how emotions cannot be entirely controlled by thinking but can be regulated by thought. According to Oatley and Jenkins (1996), Descartes' account of emotions is remarkable for combining the mechanisms for emotions with the idea of functions. Spinoza Baruch a 17th century philosopher, connected the concept of ethics to emotions. He stated that emotions are passions and the real source of trouble for humans. Spinoza was probably the first in Europe to propose that to understand our emotions and their origin is to be liberated from bondage. Spinoza's philosophy comes very close to the orient's view of 'worldly' emotions and the need to attain salvation by overcoming attachments to them. While emotions are universal and same in the east as well as the west, the way they are expressed and interpreted are different.

Only in the late 19th century emotions became the subject of scientific curiosity with the publication of Darwin's – 'The expression of emotions in man and animals' in 1872. Darwin's work established the biological basis of emotion, which till then continued to be associated with the heart as a mysterious phenomenon. Then emerged in 1884 one of the most interesting early behavioral theories of emotion called the James-Lange theory. Carl Lange a Danish psychologist proposed the theory at the same time William

James did but independent of each other. James –Lange theory of emotions was counterintuitive and proposed that first the physiological changes happen in the body which are then sensed as emotion by the brain. Later day researchers have established that experience of emotion in the mind and the body is concurrent. However the seat of emotions was elusive and the heart continued to be a symbol of emotions for the romantics.

Contemporary Neuroscience researchers like Damasio (1992), LeDoux (1993) amongst others, identified the limbic system and amygdala within it as the seat of emotions. They established that the limbic system has capability to take decisions independent of the cortex. They found evidence to indicate that the limbic brain works much faster without the conscious cognitive participation of the individual. This means that the individual may not be aware of the decision taken by his or her emotional circuitry at the subconscious level without his or her conscious efforts. Researchers wanting to study and record emotions may or may not get a respondent to answer questions on emotions that they may be experiencing during an experiment. Emotions therefore need to be studied through indices, and other indicators such as preferences and feelings that are expressed and observed in the social context and environment.

With powerful scanning technology such as Magnetic Resonance Imaging and Computer Assisted Tomography, neuroscientists can observe and measure the intensity of an emotion-induced activity in the brain. While physiological parameters such as skin temperature, heart beat, blood pressure are already being used to measure effect of emotions, scientists for the first time can observe the activities of the emotional brain in real time using MRI, CAT and PET scanning. The early 20th century view of emotions, that of being subjective and mysterious, has undergone a see change. However emotions are very complex phenomena connected to consciousness and as yet are far from being predictable with high accuracy. Much needs to be yet understood about emotions. Emotions are difficult to define concisely. “Every one knows what emotion is until asked to give a definition” (Fehr– Russel 1984). Emotions have definitions from several points of view. Some of them are:

a) Behavioral Psychology definitions (James-Lange 1884 and many thereafter)
b) Evolutionary theory based definitions attributed to Darwin- 1872)
c) Cultural Theory based definitions (Heelas -1986 ; Eakman -1995)
d) Aesthetic theory based definitions (Panofsky ; Bharata a 4^{th} century AD Indian philosopher)
e) Neurobiological theory (Damasio -1992 ; LeDoux -1993)

For the Artificial Intelligence (AI) specialist the neurobiological definitions are more useful. For HCI specialists the Cultural and Aesthetic theory based definitions are more interesting than the others. For HCI specialist not only emotions but also the effect of emotions on humans, called as 'affect' is necessary to be understood. Findings on emotions in literature are enormous. Some selected characteristics of emotions, reported by researchers and which may be of interest to the HCI specialist, are listed below. The list is by no means exhaustive.

f) Emotions are both biological and psychological phenomena happening concurrently.
g) Emotions can mediate and decide on the valence of a stimuli without the human consciously knowing about it.
h) Emotions are a way of 'thinking' and are not opposed to reasoning. No rationalisation can happen without emotions coming into play in the background.
i) Sensing and Understanding happens simultaneously.
j) Emotions give rise to actions. No interaction can happen without emotions being involved.
k) Humans and their emotions cannot be isolated from each other either for purposes of analysis or synthesis (design).
l) Emotions are not learned behavior. They are universal and innate. Only the way they are expressed and interpreted differs from culture to culture.
m) Emotions evolved in Humans as a means of communication with themselves as well as with others and things in the environment.
n) Body language, facial expressions, voice pitch and tone variations are some of the mediums of emotional expressions in humans. Many of these are very subtle and escape normal observations.

Emotions and Culture - their potential in HCI

Confronted with disappearing geographical boundaries and technological constraints, researchers in HCI have to now grapple with issues such as how to make computers (and other digital products) that ensure meaningful interaction for a global user and yet fit into the local social and cultural environment. HCI researchers are being asked to resolve usability issues at the cross cultural level in the planes of artistic, aesthetic and social experience of the user. In Usability engineering, user's experience is now being better understood as a cognitive construct. According to findings in neurosciences -Damasio (1992), LeDoux (1993) apart from aesthetic, social, cultural and functional aspects, emotions form an important cognitive construct in the user both at the individual level as well as at the collective

social community level. Understanding the emotions of a group of people can become a means of understanding the underlying framework of the culture that holds the group together. Culture yields constructs of emotions that in turn can be used to predict social action of not only the group but also the individual belonging to the group. Computers' increasing role as social and cultural change agents will necessitate new interaction design paradigms and this is possible by studying emotions at the culture level. Cross-cultural testing in HCI is likely to become a delicate issue as the tendency to outsource testing work increases (see Clemmensen and Goyal 2004). Studying emotions and making use of them as additional indices, be it to design better human – computer interactions or to collect data or to validate the test results across different cultures, is likely to hold many benefits for the HCI specialist..

Emotions are the brain's language at the limbic level resulting in 'feelings' either experienced by the human or expressed by the human. Oatley and Jenkins (1996). One definition given by Hofstede (2001) states that Culture is collective programming of the 'mind'. The 'mind' according to Hofstede, stands for thinking (head), feeling (heart) and acting (hands). Emotions as stated earlier lead to action and are expressed as feelings. Emotions are also a type of thinking. Therefore emotions can become constructs to measure collective minds given a cultural context.

Alternatively given a cultural context one can attempt to understand the emotional framework underlying that culture by identifying and catagorising the evoked emotions of individuals that make up the cultural group. Both thinking and emotions when integrated into cognation are cultural indices. HCI specialists already rely on cognitive variables such as perception, memory, learning and thinking. They need to rigorously include emotions too. Emotions can become constructs to identify culture and cultural traits that can provide valuable inputs to the HCI specialist while designing interactions in the social and cultural plane. The problem is how to measure these emotions to reflect their cultural construct.

Measurement of emotions as a cultural construct.

Guilford the psychologist stated that culture is to human collectivity what personality is to the individual. Personality is a derivative of emotions. Emotions over a period of time become feelings, which in turn become moods. Moods, with the passage of time, become personality traits. Emotions and their impact on the user at different time scales resulting in

various states are shown in Fig 1. (from Pradeep Yammiyavar)(2000). By identifying and classifying personality types and traits, it should be possible to model an emotional profile of the user. Other way round given the emotional profile of a user, a personality type can be modeled. Knowing the personality type it should be possible to know before hand the type of culture such a personality would prefer and be emotionally comfortable with. Given a group of individuals that have similar personality traits it should be possible to know the type of culture that will be evolved by the group. Personality traits collected can become indices for emotions and vise versa.

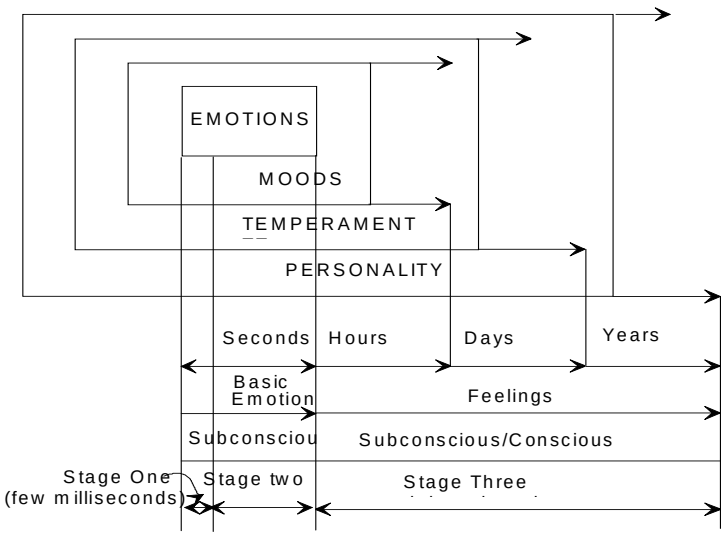

Fig 1. Time scales for influence of emotions and their relationship to personality.

Along with personality traits, the beliefs and values held by individuals can also be used for emotional profiling of a user. Values and Culture have been used as key constructs by Hofstede (2001) in his widely quoted studies. Hofstede states (page15 of Hofstede 2001) thus "In studying values we compare individuals. In studying culture we compare societies." Culture presupposes a collectivity. Values help identify the basis of a collectivity. Individuals as well as collectives hold values. A value is a broad tendency to prefer certain emotional states over others (Hofstede 2001). Thus by measuring emotional states (feelings), one can attempt to predict values that are likely to be held by a group. Further knowing values one can identify the basis of collectivity. Similarly knowing the value system of a group of individuals, it is possible to predict the likely emotional sates preferred by a

group. Such knowledge of emotional preferences is useful to the HCI designer at the aesthetic plane and can be used in designing visuals, graphics and communication for better interaction.

Values are feelings with valiance attached to them. Feelings are affective states induced by emotions over a period of time. Feelings also have intensity and direction (salience). Using Likert's and Osgood's (1957) scales, feelings which are affective states of emotions, can be elicited from individuals. Humans in a group having same values are comfortable with each other and also comfortable with other groups sharing similar values. Sharing similar values ensures emotional congruency. Several social science researchers have observed and stated that it is in the nature of humans to seek emotional synchronacy with others to maintain a state of contagion.

Both personality traits and Values hold potential to help measure emotions as cultural construct.

Another potential problem HCI specialist could face on the aesthetic plane is that of measuring emotions on the aesthetic level of experience involved in interacting with computers. By aesthetic level is meant the visual and other senses involved in appreciating and enjoying pleasant experiences during the interaction. Emotional experiences on the aesthetic plane are different from direct emotional experience of the individual. There is a 'distancing' involved in experiencing emotions on the aesthetic plane as for example - enjoying the experience of a clown in distress. 'Distress' can be 'enjoyed' only by 'distancing' and becoming an observer. At the same time there is empathy with the clown. The Indian treatise on *Natyashastra* (4^{th} century) by Bharatha offers the concept of nine sentiments (*navarasa*) to measure and experience emotions on the aesthetic plane. This concept has been used to measure emotions evoked by designs across cultures. (see Pradeep Yammiyavar 2000).

Thus knowing personality traits, knowing feelings (responses to emotions on the aesthetic plane) and /or values it should be possible to predict the type and characteristics of culture to which the individual belongs or would prefer to belong. Such data helps in creating mental models of the user's emotions, which in HCI, are necessary for designing interaction.

Differences or Commonalities - which could be more useful in HCI.

The five dimensions given by Hofstede (2001) using which cultural differences between countries can be measured have been extensively used and widely quoted. These dimensions are (a) Power distance. (b)

Uncertainty avoidance. (c) Individual v/s Collectivism. (d) Masculinity v/s Femininity. (e) Long term v/s Short term orientation. Hofstede's dimensions measure differences in cultures and were derived from observing behavior, action and attitudes based on questionnaires given to working individuals in multinational companies. Responses reflected attitudes to working conditions and authority figures in the organizations. If culture is defined as collective programming of mind, Hofsetde dimensions reflect to a large extent the working professional's mind, which are in all probability predominantly logical thinking minds.

It is posited here that dimensions based on emotional thinking mind are better indicators of cultural coherence amongst individuals making up that culture.

The second posit being made is that it is the 'commonalities' that should be measured rather than the 'differences'.

The third posit is that cultural commonalties are more likely to yield insights useful for HCI designers rather than cultural differences. It is the 'understanding' of cultural differences rather than the observed differences themselves that an HCI designer should aim at.

The basis of making the above posits is that it is not by studying the external commercialized world of objects, market trends, graphics etc that one can get clues to culture but it is by observing the collective beliefs, values and attitudes of humans to these objects that make up a culture. Emotions /feelings evoked in humans are more reflective of the underlying values beliefs and attitudes. Observed differences between two cultures may yield 'positions' but when more than two cultures are to be studied 'differences' quickly multiply into heterogeneous bits of information. Multiple bits lead to confusion and often contradictions. Several researchers like Elaine Ann (2003) have observed that ethnographic surveys based on western model of thought are likely to observe differences which may not exist or are not differences when seen from the lenses of the other culture. While differences are necessary to understand other cultures, they may not provide useful heuristics to HCI designers based on which interactive communications can be designed. Culture probes like Design Souvenirs experimented by Lori Webb (2004), if designed to elicit differences only, will result in longer lists of characteristics of the cultures under probe that are difficult to translate into applications. Accommodating for a large number of differences is difficult while designing interactions. For HCI specialists commonalities generate heuristics that can be used for designing

interactions. Commonalities are more manageable than differences when several cultures are involved.

Results of an experiment (Pradeep Yammiyavar 2000), to find out how much commonalities can exist between cultures in terms of emotional responses to a product's design are briefly reported here. The experiment was also to find out if physical design features evoke similar emotional responses across different cultures. The experiment involved categorisation of 44 different designs of products by 175 Indian and 56 European subjects. Categorisation was to be done under 10 emotional categories such as sad, marvelous, ugly, fearful, friendly, furious, comic, pleasant, delicate and heroic. The categorisation had to be done based on feelings evoked by the designs without being concerned with the functionality or origin of the product. The respondents were also asked to pick their choice of five most liked products and rank them in order of preference.

Perceptual maps for each product, showing the frequency for each category of emotion were plotted. Fig 2 to 5 show the evoked emotion maps for four of the 44 products. 45% percent of the 44 products tend to evoke similar set of emotions across both the culture groups. However preferences for the 'most liked' product were different for both the groups. The Europeans have associated ugly and fearful emotions with more products than the Indians. Europeans have preferred playful, comic evokers as first preference where as the Indians have preferred marvelous and delicate emotion evoking products. These differences between Europeans and Indians are with respect to preferences in product designs. However if one were to look at the emotions themselves, there is significant commonality valence wise as seen from their distribution frequency. Five of the emotion categories had almost nil difference between Europeans and Indians in terms of relative frequency of being evoked. The results indicate that emotion preferences like comic, sad, ugly and delicate seem to have commonalities between Indians and Europeans. Though as different as 'East" and 'West' both cultures seem to respond similar to each other as far as a group of emotions are concerned. A Gestalt analysis of the design features of the products under an emotional category showed that there are indeed common physical features in products grouped under a particular emotion by both the culture groups. The study leads to a hypothesis that products (and interfaces) can be designed to evoke similar emotional responses across cultures despite there being differences in aesthetic preferences.

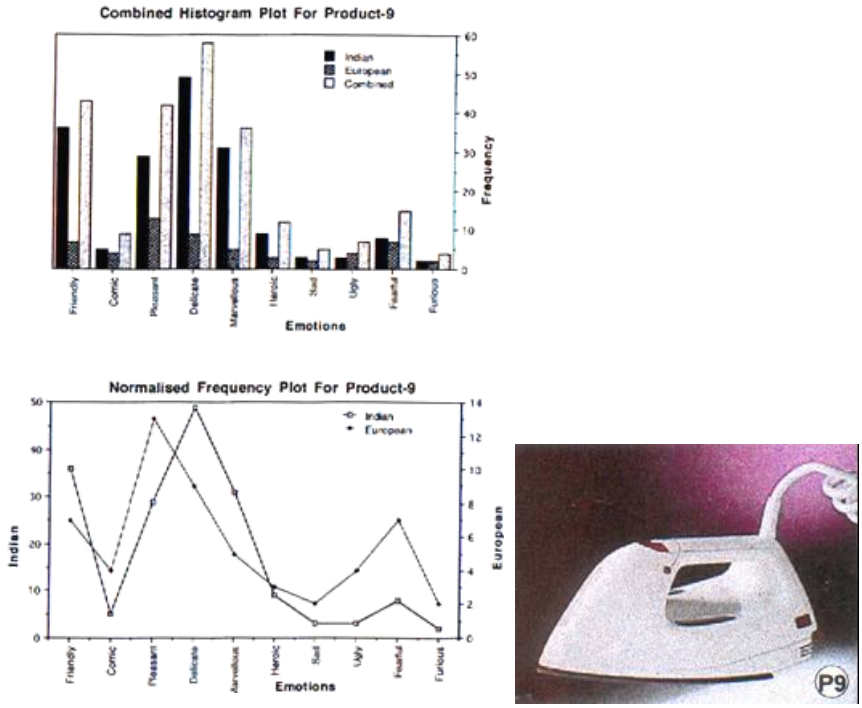

Figure 2. Perceptual map showing similar responses form European and Indian subjects for the Product P9.

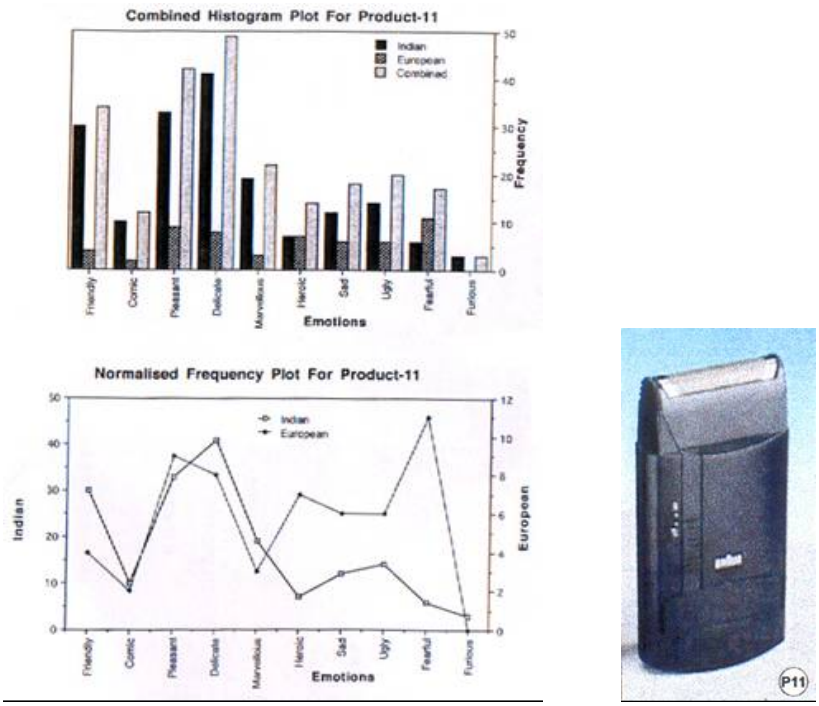

Figure 3. Perceptual map showing similarity in the positive emotions and differences in the negative Emotions evoked.

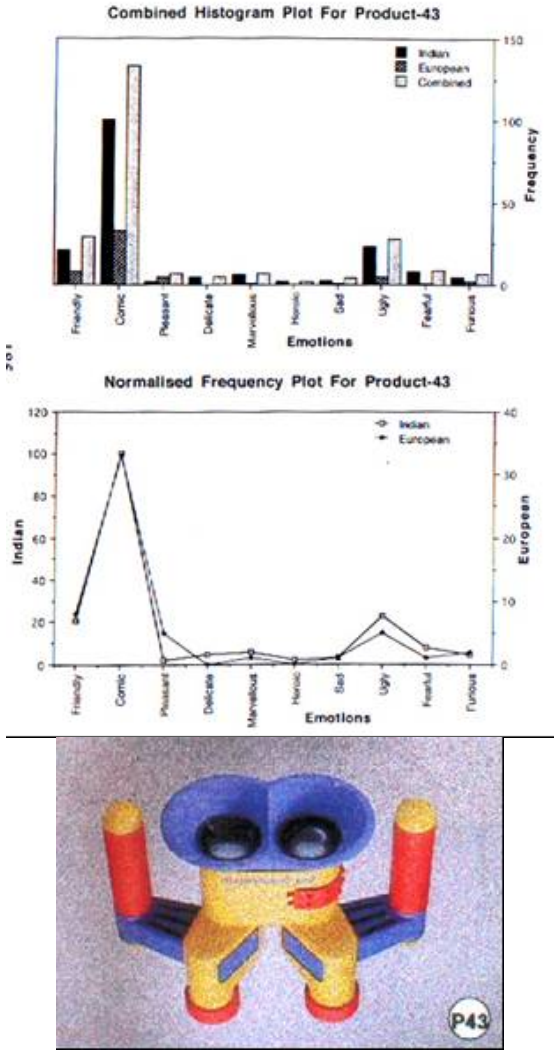

Figure 4: Perceptual map showing almost a perfect match between the responses of the two cultural groups

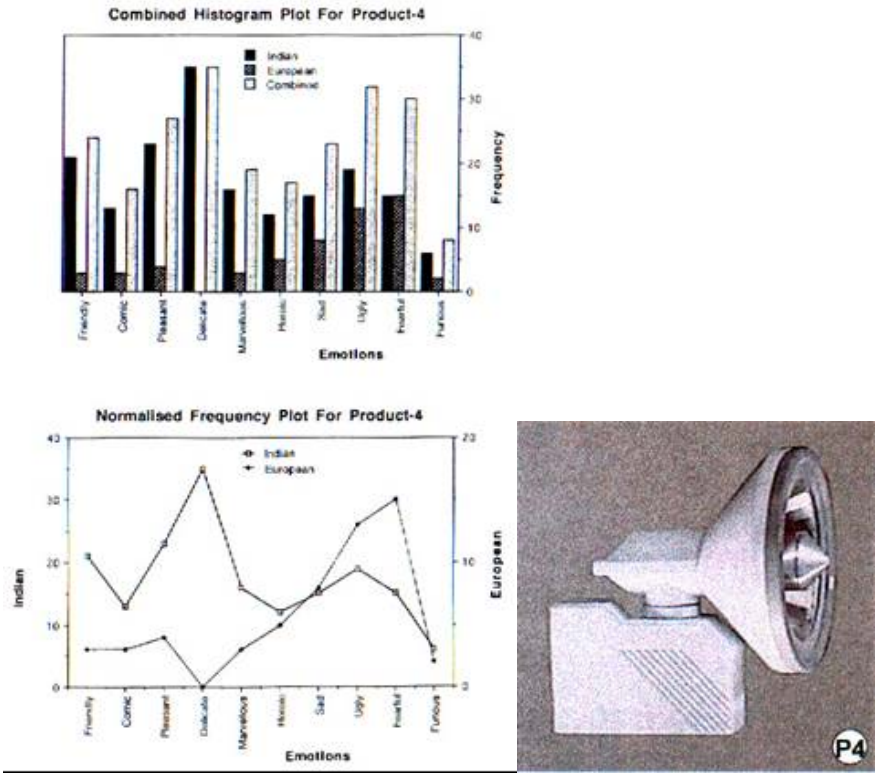

Figure 5: Perceptual map showing wide dissimilarity of evoked emotions in Europeans and Indians

Results similar to the above have been reported in literature. For example Carl Ratner (2000). states "Integrated into cognation, emotions are culture just as thinking is" and presents evidence which shows that the biological processes mediate but do not determine emotional qualities and expressions. On the other hand cultural processes and factors determine particular qualities and experiences. Biological processes are individual level emotional responses where as cultural processes are community level collective responses. Articulating the cultural nature of emotions requires a comprehensive coherent concept of culture, which arises from commonalities rather than differences.

HCI researchers like Clemmensen (2004); Elaine Ann (2003); Hariandja and Daams (2005) have pointed out problems in cross cultural testing that arises out of differences in testers and users cultural back grounds. Most problems are in the realm of semantics concerning language and conventions. While these do deserve attention another set of cues from testing situations based on emotions and feelings can reinforce observations and thereby reduce problems caused by biases of cross cultural variables.

For example in an workshop on cross cultural evaluation of think aloud method (Clemmensen, Pradeep Y and Goyal S- 2005) local Indian evaluators could understand the local test user's responses better than the European evaluators even though English, a common language, was used. It is possible that Indian evaluators were aided sub consciously by hand and head gestures of the test users to consider moods and feelings of the test users in conjugation with what was spoken out aloud in words. Had the European evaluators been trained to interpret gestures of the Indians by linking them up to spoken words, the difference in number of usability errors spotted by European evaluators and Indian evaluators would be much less.

It is posited here that along with language, symbols and conventions, emotions /feelings aided by gestures and other body signals can act as validates of cross-cultural results by aiding in finding of commonalities.

Along with differences HCI researchers would benefit by investigating commonalties in the background cultures. Emotions/feelings can aid in this task

Emotions useful for HCI.

Not all levels /types /categories of emotions are useful to HCI specialists at all times. Of the three broad categories of emotions, two - namely 'primary' and 'secondary' group are mentioned most often in literature. Primary emotions like fear, anger, sorrow, disgust are results of a stimulus - response chain of events and have been hard wired in the brain. These emotions form the basic metric value of a set of emotions but have a limited direct application value in design. According to LeDoux, secondary emotions are the product of a feed back loop and result in feelings. Secondary emotions like anxiety, stress, and pleasure are important to HCI as they affect for longer duration and often involve the continuous interaction of the human with the environment.

In addition to primary and secondary categories Damasio proposes a third one consisting of emotional states in resting phase- an emotional homeostasis. In this state the other two categories are quietly humming in the background. The most cited model of the social spectrum of emotions is the Lazarus (1991) classification (see Fig 6). Other models like Fischer (1990) and Pulutick(1991) are also resourceful to the HCI designer and researcher.

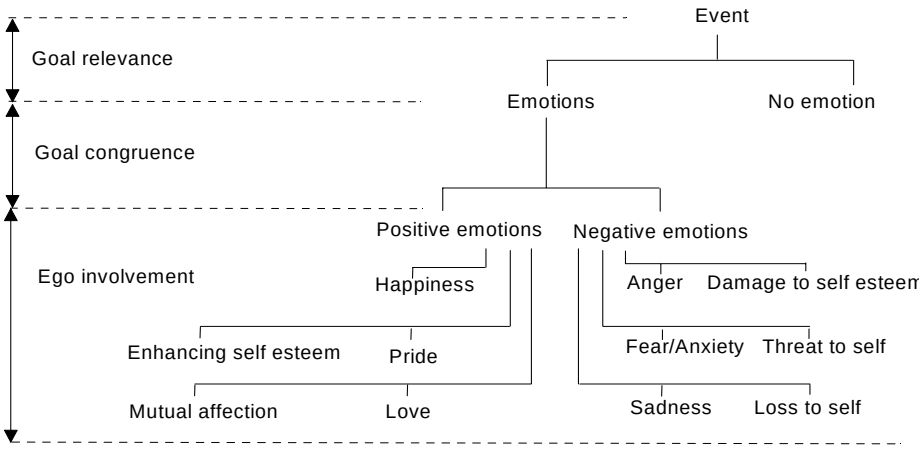

Figure 6: Lazarus' classification of emotions.

EMOTIONS AND COMPUTERS

From being intelligent but cold calculating machines of the 80s, computers have evolved into sentimental personal products cutting across geographical and cultural boundaries. Computers are every where including in the form of office machines, toys, home appliances, communication devices, entertainment products to personal robot assistants. Statistics (Myers 2005) indicate that the world spent 1.19 billion hours on the Internet last year. In 2001 Denmark had the worlds highest Internet penetration of 54%folloewd by 50.9% of US. Three out of four citizens in Denmark use email for communications (Reuters 2001). In the United States of America alone over a 100 million people use mobile phones. In India there are 3.7 million computers with an annual growth rate of more than 10%. The world over it is as though humans are interacting with digital products much more than with each other making one wonder if it is time to forcibly redirect the focus from Human - Computer Interactions to Human Centered Interactions as has already been done, as the name indicates, at the PG Research laboratory in HCI at the Aalborg University in Denmark.

Driven by passion of the AI community computers have acquired the first rudimentary capability to recognize and express emotions. Affective Computing has been defined by Piccard (1997) as "computing that relates to, arises from or deliberately influences emotions". The MIT media lab has reported several industry projects such as Kismet - a robot that recognizes emotional expressions, Wearable computers to name a few. Similarly Sony of Japan has been selling *Aibo*, the dog like robot for entertainment. There is

no stopping now from making emotion enabled products. Computers have emotions albeit 'fake' ones according to some philosophers. Emotions are emotions – whether fake or real. Humans often fake emotions too. Humans respond to both fake and real emotions, sometimes knowing they are fake. The issue in HCI is not about fake or real emotions being in computers but how good these can interact with humans.

Computer GUIs sport many emotional agents such as Emoticons, Smileys (animated faces) and voice agents. It is at the moment one-way communication of emotions. Nonetheless it makes computers fun to use for those who want them to be so. Humor and fun have high emotional salience. Emotions in GUIs can help humans communicate with themselves. The computer acts as a reflector.

HCI researchers need to prepare for the next level of emotionally intelligent computing technologies. Biometric recognition of emotions will make computers sensitive to the moods and feelings of the user. For example the user, in a bad mood for the day, will not be shown information on the screen that is likely to upset the user till his moods improve. Important decisions will be held back by the 'emotionally intelligent computer' that has been tuned to learn about the users emotional states. The music played on such a gloomy day will be synchronous with the moods of the user without the user having to make the choice or know about it. HCI specialist will be called in to establish better interaction with such ‘emotionally intelligent’ computers. What type of usability heuristics will the HCI designer need in such a situation? Computers, from being currently 'emotionally enabled' will become 'emotionally intelligent' in less than a decade, thereby providing problems and opportunities for the HCI designers and researchers to work on.

Computers can have emotions expressed on the following planes:

(a)Aesthetic plane (b)Cultural plane (c)Physiological plane (d)Technology plane.

Emotions on the aesthetic plane will have attributes of beauty (appearance, Experience, Hedonism and empathy. (Pradeep Yammiyavar 2000). Emotions on the culture plane will have attributes of Identity, Value, Ethics, Tolerance and Sympathy (based on Hofstede's cultural dimensions). Table1.shows the metrics proposed for the attributes on the aesthetic and cultural planes. These metrics can be used to classify and empirically define the affective component of emotion.

Emotions in the Aesthetic Plane	Proposed Measures
Beauty (Appearance)	Rating scales
Experience	Valence scale
Hedonism	Salience scale
Empathy	Valence scale
Emotions on the Cultural Plane.	Measurers
Identity	
Value	Personality test scores
Ethics	Questioner and observations.
Tolerance	
Sympathy	

Table 1:. Proposed measures for emotions acting as cultural constructs.

EMOTIONS AND INTERACTIONS - FUTURE COURSE OF ACTION IN HCI

There can be ‘one to one’ interaction or ‘one to many’ interactions involving a computer and a human. In ´one to one´ interaction, the computer and the user from a closed system with the computer acting as a *reflecto*r of thoughts, emotions and action. In the one to many interactions, the computer, the user and the outside world, all interact. In ‘one to many’ interaction the user may or may not interact directly with humans or their personas. Interaction could be with the outside world as an onlooker with no particular individual involved. When humans are not involved the computer acts as a *deflecto*r of the user's emotions dissipating and absorbing emotions. When human beings are involved in direct communications the computer acts as a *diffus*er of emotions. (Table 2).

In ‘one to one’ interaction the HCI designer needs to ask how to facilitate and design the interaction so as to achieve 'Co-action'. In ‘one to many’ interactions the HCI designer needs to ask how to design the interaction so as to achieve 'Contagion.'

The posit for interaction is not to make computers that can judge and decide human behavior and intelligence on its own but to build computers so as to be able to reflect, deflect and diffuse emotions to benefit all. It is appropriate to quote Piccard (1997) here who stated, "Affective computers are not a

substitute for affective human beings". In other words HCI specialists should aim at computers that can sympathise and empathise by co-acting with the user. The aim of HCI should be to achieve contagion in the H-C-I relationship. The emotional intelligence of humans needs to be matched with the emotional intelligence of the computers.

Emotional Need of User	Characteristic of an Emotional enabled Computer	Role
Me, myself, my feelings, my activity - all for my benefit	REFLECTOR of emotions	Co-actor Empathyser Companion Assistant Confederate
They, their feelings, their views, their activities - my catharsis.	DIFUSER of Emotions	Mediate Transform Translate Transmit Facilitate
They, their feelings, their activities and their catharsis	DEFLECTOR of emotions	Inform.

Table 2: Proposed frame work for defining the emotional role of a computer.

Which parameters or personality traits of the user can be used to predict contagious behavior? Which emotional states and at what levels of salience can they become indices of contagion are the immediate questions. It is known that positive emotions reinforce contagion and negative emotions produce counter-contagion. In the words of Hatfield et al (1994) "emotional contagion is best conceptualized as a multiplier (effect) determined by (a) family of psycho physiological, behavioral and social phenomena". When emotions and feelings become infectious in a community of humans (example web groups & blog groups) a sate of contagion is achieved. Contagion is not to be mistaken for 'flow'. If flow is the state of immersion in a computer task, contagion is the experience of empathy at the emotional level. AI specialist will need to build emotionally intelligent computers and HCI specialist need to design their interaction so as to achieve contagion.

Much of HCI practice so far is based on the objective rigid framework laid by schools of Behaviorist psychology, Ergonomics and Artificial Intelligence. The studies of emotions offer an opportunity for HCI specialists to formulate a different framework for the emerging future. Using emotions HCI specialists can aim at a better interdisciplinary HCI practice by synthesizing Design, Psychology, Culture studies and Artificial Intelligence inputs thereby giving rise to Affective Engineering.

CONCLUSIONS

Emotions cannot be either separated or ignored from humans and computers as well as their interactions. From being dismissed as subjective irrational phenomena, emotions to day have taken centre stage in Neurosciences, AI, Cognitive sciences and Design. Emotions can be approached today as objective observable and measurable phenomena. Emotions can be empirically treated. HCI researchers need to focus on emotions on the aesthetic and cultural planes. Emotions can act as indices for understanding cultures. Emotions can be used to study underlying patterns in culture that have a bearing on the use of computers as social tools. HCI can gain more if not equal from studying the commonalities rather than the differences, when emotions act as cultural constructs. Emotions can become additional indices in cultural studies thereby reducing errors due to culturally induced human bias in observations. Along with language, symbols and conventions, emotions / feelings aided by gestures and other body signals can act as validates of cross-cultural results by aiding in finding of commonalities. Emotions on the aesthetic and cultural planes have greater role to play in HCI than basic physiological level especially when the computer acts as a mediator between the user and the world. An emotionally enabled computer should be able to reflect, defuse and deflect emotions in the user. It will then said to have achieved 'emotional intelligence'. The future will see emotionally intelligent computers (EICs) that will require interacting with them to produce a state of contagion for the user.

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DESIGNING GAMES – BALANCING FUN AND SERIOUSNESS

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INTRODUCTION

Games have been used for several years within cooperative design. In the 80ties when GOFAI (Haugeland 1985) was introduced, many of those who opposed generic modelling referred to the late Wittgenstein's theory of language games as carriers of the order, the tradition and the silent rules of a practice (Dreyfus & Dreyfus 1986; Ehn 1988). Putting the creation of meaning on top of the research agenda lead designers to reflect on the ways meaning is created during design and they started to look for instruments to spark new meanings, new ideas. Since the genre and discourse of gaming was already on the table, researcher-designers started to play with the idea of building meaning from anew by inventing games as in the work of Ehn and Sjögren (1991) where games are played by designers and users with the purpose of establishing shared languages for solving design problems. Recently Johansson and Linde (2005) have demonstrated how to use games to explore video fieldnotes as a way to spark new ideas together with users or among a group of designers. The idea is similar to the idea of using cultural probes as suggested by Gaver, Dunne, and Pacenti (1999). Here we take the design of a design game as a second order design process (design of design), which frames the first order – or the real – process: to design a game to bring out ideas for design is both producing the rules for the design process in which it is going to be used and it is a reflection upon the action of design. The designers are forced to reflect on their purpose, their timeline, and their resources. Because of this formative and reflective potential, we find that the design of games deserves more attention in design education. Consequently, we present how we at the moment are working with design of games as part of teaching design at university level.

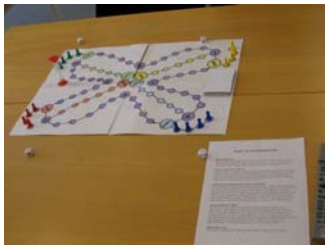
DESIGNING GAMES

Games were introduced in participatory design to provoke the development of a shared understanding among the players, users and designers alike and to form a basis for dialogue (Ehn & Sjögren 1991). Likewise, the game must help moving beyond an understanding of the current practice and generate ideas for future design (Johansson & Linde 2005; see also Bødker & Christiansen 1997). The workings of the opening of the mind that gaming generates may be explained by Bateson's reflections on fun and seriousness, fantasy and games (Bateson 2000 pp. 14-26 and 177-200). Especially when it comes to understanding why the rules of a design game – silent as well as explicit – must find a balance between fun and seriousness. Bateson calls attention to the characteristics of games as a serious business in which we are able to generate new ideas by playing down unknown paths (Bateson 2000, 17). Playing is an exploration of the rules of order, a "muddle" which gets us "somewhere" (op.cit. 19). The exploration of the rules for what makes something "for real" and something "for fun" is part of the experimentation of design – but is is also what makes gaming playful. So when students develop design games, they become educated in the special nature of design-experimentation, which is a different form of scientific experimentation in not aiming to replicate the experiments, and different from social science in not being post festum analysis of what has already taken place.

The following presents first draft outcomes of design games from a graduate design course. The pedagogical paradigm is experiential learning where students work with the games as a part of a course in user driven innovation. The games are constructed at a design workshop where students work on designing artefacts that motivates private households to save electricity and water. Materials for the games are video sequences of in situ interviews with families on energy consumption. The purpose of each game is to make the participating users generate ideas for future design by telling stories triggered by the video sequences but with no limits on whether to stay close to these data, the participants own experience, or imagination.

"The energy game" [1]

"The energy game" is a board game with a game master and room for four participants. At the board four boxes represents rooms in a house. In each box/room are plastic cards representing a video sequence. Between the boxes is modelling vax representing fuses. In the middle of the board is an arrow, which the participants turn. If the arrow points at a box the participant throw a dice which has three possible outcomes a) fuse, b) economize or c) squander. The participant then picks a card from the box, which the arrow is pointing at and the game master plays a video sequence related to the card, and the player is then to tell a story about either economizing or squandering. The story has to be approved by the other participants and by the game master discussing its relevance. If the participant is not able to start telling a story within 10 seconds a fuse "blows" meaning that the game master removes one of the fuses from the board. If the dice lands on "fuse" the game master also removes a fuse from the board. The game is over when there are no more cards in the boxes. If all fuses are removed before the card-boxes are empty the game master wins.



"Energy consumption ludo" [2]

"Energy Consumption Ludo" is also a board game with a game master and room for about four participants. All participants have four pieces, which are to be moved from the beginning to the end of the path on the board. The rules are similar to regular ludo: when the dice lands on 6 the player can throw the dice again, when the piece reach "start" on the board the player draws a card representing a video sequence which is played by the game master. After this the player is to tell a story for at least two minutes about a situation in his/her own life related to the video sequence. If this task is handled the piece can be moved forward to the next "start" on the board.

[1] © Jakob Østergaard Jensen, Lars Byrialsen, Diana Nygaard, Peter Grønkjær, and Michael Bruun Jacobsen.

[2] © Anders Hoffgaard, Helle Bendsen, Morten Jacobsen, Nikolaj Dam Østergaard, Kristina Margrethe Rasmussen, and Simon Hiort-Lorenzen.

The game is ended when the piece reaches "home" on the board. If one player's piece lands on the same spot on the board as another player's piece the other player/piece has to start over.

"Das Ding"[3]

In "Das Ding" the four participants are given different roles: a) the environmentalist believing in Kyoto, energy consumption and the green life, b) the economist believing in the cheap solution, spreadsheets and the secure life c) the aesthetic person believing in design products, beauty and the good life, and d) the practical person believing in functionality, convenience and the easy life. On the table are several plastic cards with symbols such as toilet, light bulb, refrigerator, etc. The participants throw a dice where 5 gives the chance to change roles and 2 gives the chance to pick a card from the table. If 2, the game master plays a video sequence related to the card and the participants is then to argue, using their roles, how "das ding" (a white box which can be anything that the participants want it to be) can be used in the situation. The arguments are valued by the other participants who through discussion decide whether the participant can keep the card or not. When all cards are taken the participants can "steal" from each other, again having to argue, why they, with their role, should have a card rather then the other participant. The game ends when time is up and the winner is the participant who scored most cards.

"The energy narrative game"[4]

"The Energy Narrative Game" is a card game with a game master and room for 3 or more participants. The group of participants are given a theme e.g. "energy consumption" or "energy use" and 7 cards each representing 7 video sequences. The participants are asked to select 5 cards out of the 7 available and put them into a narrative on the given theme. If the game master finds that the narrative is too weak (s)he can play a video sequence and demand the players to use this sequence in their narrative. The game is over when all narratives are made and approved by the game master.

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[3] © Nina Lilholt, Casper Gregersen, Shaq Nakhost, Jonas Dinesen, and Janus Hove Jørsensen.

[4] © Thorbjørn Munck Mortensen, Niels Holch, Annie Akil Pedersen, Alex Zakrisson, and Magnus Vestereid

THE PLAYFUL BALANCE

As stated earlier in this paper, the exploration of the rules for what makes something "for real" and something "for fun" is part of the experimentation of design – but it is also what makes gaming playful. Playing with the games presented above was videotaped. The students played each others games and the players gave feedback to the designers. What came up as the most delicate topic in the after-critique was the balance between fun and seriousness: some games were too serious and some maybe too much fun to generate design ideas. In all games, the game-designers' purpose was to get the players to come up with ideas/arguments/feelings about energy consumption, stories, which would work as input to the user driven innovation workshops. The fun part of all the games is the "muddle" where daily life is represented by boards, boxes, plastic cards, etc. Playing the game is the road to follow, a journey. Whether the journey is experienced as playful by the participants turned in our experiments out to be a matter of a '80/20-balance': the players should feel at home with the problems and the options for solutions given, but not bored. Also contributing to the balance was the participants feeling to be put on stage, acting, while still having the option to withdraw to the safe of 'this is just for fun'.

In each game there turned out to be a specific 'balance trigger: In "the energy game" the balance trigger was in the blowing fuses. A blown fuse means a score to the game master. In this way the participants are playing against the game and cooperating in order to "win". The same type of competition against the game is found in "the energy narrative game" where the participants also cooperate on generating narratives in order to satisfy a strict game master. Returning to Bateson, these games are designed for "playing together against the building blocks – the ideas. Sometimes competing a bit – but competing as to who can get the next idea into place" (op.cit. 17). It is exactly this "playing together" and competing on "the next idea" which in our material seems crucial for generating ideas. The 'balance-trigger' in "the energy consumption ludo" was the demand for two minutes stories on energy use from the participants. Telling stories in two minutes really pushed the participants to the extreme often resulting in fun stories and situations in the last long seconds. This specific balance-trigger, however, did also challenge the participants' patience more than it challenges their creative imagination. In the debriefing session the participants were especially calling for "something which can give space for wild ideas". Such a "space for wild ideas" was found in the game "Das Ding". The stories made up by the participants in this game quickly became wild and the participants even competed to get their hands on "Das Ding"

not minding the effort of having to create a story – a contrast to the ludo-game where the participants tried to avoid having to tell a story for two minutes. In our interpretation the latter produced a better balance between real life experiences (seriousness) and imagination (fun).

CONCLUSION

We have argued that the design of design games is important. Not only to have as an instrument in the designers tool box, but also and mostly because in this way designers get to walk through their own ideas of what they want to achieve through design. Hence design of design games deserves more attention from design researchers. In this paper we have analysed an instance of students designing and playing games. The finding we have reported and which we find interesting enough to pursue further is the balance between fun and seriousness that seem to be the generator of design input: how to conceptualize it and how to design for it?

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TRAPS & TRIGGERS -DESIGN FOR DISCUSSION

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INTRODUCTION

This paper presents a workshop -*TRAPS & TRIGGERS* -that took place at the University of Aarhus in 2005. The workshop was part of a greater course, *Interaction and Space*, where students work with innovative and spatial interaction design. The paper describes the approach of the workshop by relating it to other design traditions and finally evaluates the outcome.

BACKGROUND

The workshop TRAPS & TRIGGERS took place in March 2005 in CAVI, Centre for Advanced Visualization and Interaction, University of Aarhus. The workshop was carried out as a joint project between the two English interaction designers Ben Hooker and Shona Kitchen (DATACLIMATES) from Royal College of Art in London and people from the University of Aarhus. About 16 student divided into 5 groups took part in the workshop and worked for a month with a specific approach to design introduced by the English guests.

The approach was based on critical design; meaning design that asks questions and makes us think in alternative ways instead of necessarily answering any questions (Dunne, A. and Raby, F. 2001). Dunne and Raby state:

> *There is a place for a form of design that pushes the cultural and aesthetic potential and role of electronic products and services to its limits. (…) Critical design is related to haute couture, concept cars, design propaganda, and visions of the future, but its purpose is not to present the dreams of industry, attract new business, anticipate new trends or test the marked. Its purpose is to stimulate discussions and debate amongst designers, industry and the public about the aesthetic quality of our electronically mediated existence.*

(iBid. p 58) Dunne and Raby propose a relational design that keeps on questioning the very foundation of specific problems and socially relevant topics instead of producing solutions. The approach varies from prototype-like ideas (See for instance Tunable Cities, Dunne, A. 1999) to more finished and product-like and imitating objects (See for instance Placebo objects, Dunne, A. and Raby, F. 2001).

THE BRIEF

As a starting point the workshop participants was given a brief:

> *This is a project to explore how hi-and low-tech design interventions can be used to stimulate alternate encounters with everyday aspects of the city.*
>
> *Part 1: Sample the city*
>
> *Think of the city as a wilderness, a mysterious and alien landscape. Design and make a 'trap' that steals, samples or captures something from this landscape, e.g. a particular piece of data, or a particular kind of noise, image, object...*
>
> *Part 2: Re-tune the city*
>
> *Consider how and where your captured samples could be re-presented (physically or virtually) to the city to create a new situation. Design a system that uses trapping and triggering to mutate or 'extend' an existing space by amplifying its richness, intricacy or narrative possibilities. Find a way to test some aspect of your proposed system.*
>
> *(Brief by Hooker, B & Kitchen, S. 2005)*

The brief reveals more agendas: The students are both given a quite open ended task – to capture and release ('trap' and 'trigger') an observation in the city space -and are furthermore encouraged to perceive their surroundings in a new way and hereby call on them to (re-)explore the city:

> *Aarhus, like any city, can be thought of as many cities in one. It is a city of physical structures – of buildings, roads, railway tracks, street furniture, cables and pipes; a city of life, noise and motion – of people and animals, cars, bikes and boats; and a city of other, more transient, ethereal stuff – of radio waves, images, dust and*

data. All these component cities interact with each other to create the variety of urban spaces we are familiar with.

Consider: visible vs. invisible; quiet vs. noisy; daytime vs. night time; surface vs. subsurface; boring vs. beguiling; disgust vs. attraction; perfection vs. mutation; immaterial vs. material; dust and dirt; wireless networks; car park; bus station; tunnels; alleyways; pedestrians; surveillance; recording and transmitting; interrupting a flow; re-directing; ultrasonics; subsonics; infra-red; ultra-violet; electromagnetic...

(Brief by Hooker, B & Kitchen, S. 2005)

A similar interest in and fascination of new aspects of everyday objects with a specific focus on invisible digital information in our surroundings is seen in the work of Dunne and Raby. The designers' projects circle about the way we live with electronic objects – e.g. in the earlier mentioned *Placebo Objects* and *Tunable City*

THE PACKAGES

In addition to the brief, packages containing objects for interaction was handed out. The objects could be stickers, cord, an infrared beam alarm, a fake surveillance camera, sticky tape etc. (see Figure 1). Objects that could be used to – in one way or another -create simple setups for interaction in the widest sense and 'trapping' data in the context.

Figure 1 A package with objects for 'trapping' the context

The packages were based on the same ideas as *cultural probes* that are similar packages typically containing maps, diaries, disposable cameras etc. The cultural probes are handed out to e.g. the inhabitants of a site, for them

to use and then return with their personal stories, pictures and annotations about a specific topic of interest to the designers (Gaver, B. 1999).

In the case of the workshop the packaged was handed out to the students – the designers -free to use for what ever setup concerning the workshop. The groups were asked to use the packages in relation with their area of interest and thus begin to study the context. Even though the packages were only minimally used during the early stages of the process it showed that the introduction to new and untraditionally objects for interaction encouraged the students to feel free in their way of working. Just like the intensions of cultural probes are to open up for new perspectives and ideas, the packages contributed with a new way of thinking of interaction and the context. In combination with a collection of project for inspiration presented to the workshop participants -a mixture of art, architecture and design projects (See TRAPS & TRIGGERS) – the packages became an important part of defining the starting point for the workshop and thereby sat the agenda. The results of the workshop showed that the character of the initial material had a big influence on the students' work. They began themselves to use new materials and object in their designs and the fascination of digital phenomenon and a strong focus of (re-)exploring everyday objects showed through in their works.

The following section gives examples of the students work and discus their results in relation to the ideas of the workshop.

THE OUTCOME

One month of work including two visits from the English guest teachers resulted in a wide range of discussions and design interventions. During the month the students worked with a critical and relational perspective on design by using different scenario and prototyping techniques that they knew in advance. Their different versions of scenarios and prototypes were continuously discussed by presenting to each other and the workshop leaders.

Figure 2 Dream Trunk: an early stage

Figure 3 Dream Trunk: When the user model of the Dream Trunk that reveals a shakes the Dream Trunk it whispers other simple technological solution based on a people's dreams digital sound recorder and player

One group was interested in working with people's dreams. For this they had build different prototypes of *Dream Trunks* (See for instance Figure 2) that resulted in a version where the user could listen to audio samples of other people's dreams digitally stored in the trunk. The dreams were collected earlier in the process where the group had interviewed people on the street about their dreams. The user then had to shake the trunk to play randomly picked dreams whispered by the trunk (See Figure 3). The trunk was roughly designed and partly covered with postcards and writings from earlier users and illustrated the idea of letting people share private issue.

Another group worked with the concept of creating an exhibition space in a show window in a store in the center of Aarhus. The intension of the project was to create an illusion of an exhibition of people's 'footprints' in the local area. Footprints, meaning tracks of people's use of the area and things left behind: graffiti, tags, dropped items, bacteria samples etc. The idea was illustrated by post-producing a video feed of shadows of curators composing an exhibition of images representing the collected footprints (See Figure 4). The video was projected onto a show window and could be seen from the street during night time. Hereby the project drew the passing viewer's attention towards the many different subcultures that the specific area contains and played with bringing out overlooked items and combining them in new ways (See Figure 5).

Figure 4: Exhibition in show window:

Figure 5: Exhibition in show window:

video feed of curators working on the Video feed projected on linen from the exhibition inside of the shop creating a display towards the street during nighttime

A third group dealt with bringing attention to an arbitrary staircase by registering and visualizing specific data from the use of it. An infrared sensor was mounted at the one end of a staircase and when the beam was obstructed it reported to a computer that registered the number of users and visualized it in a simple graph (See Figure 6). In addition a real-time audio feedback was calculated and by the sound of a series of beeps the user was informed whether the staircase was 'stressed' or not. The more users during a specific measured time interval the more stress and the more beeps.

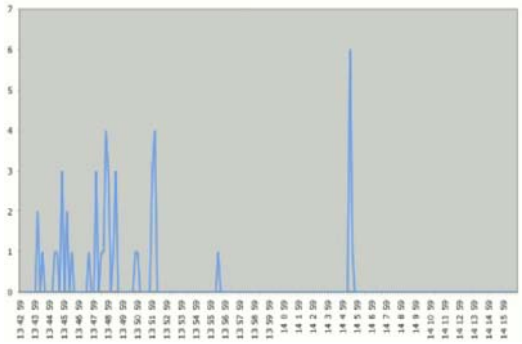

Figure 6: Staircases: A graph illustrating the total of users over time of a specific staircase for calculating whether the staircase is 'stressed' or not

PERSPECTIVES

The above projects testify that the approach of the workshop did lead to new and innovative ideas, that might not be design that address a specific user

group nor a traditional service or function, but design that is legitimated by its ability of criticizing, pinpointing and discuss socially relevant subjects.

The works of the groups has contributed with a wide range of discussions during the workshop: From the Dream Trunk that exposes something as intimate as our dreams and hereby questions private and public interrelations between people. The exhibition in the show window that brings out overlooked elements and pinpoint their existence. And the staircase project that in its simplicity of reflecting the number of users in a heartbeat-like response, plays with a personification of the staircase.

The projects all seem to have found a subtle lingo whose meaning is only understood if the process and the premises are known in advance. No user tests have been made to assure that the designs are friendly and functional; no further explanations are given neither does the designs include manuals or instructions. This lack of communication challenges the use of the design: E.g. the user of the Dream Trunk has to explore the design to -by accident -make it play. The passing viewer in front of the show window has to piece meaning together of the exhibited images. And the mystified user of the staircase is forced to observe other users to let the order of beeps make sense.

The designs developed in the workshop appear more statement-like than traditionally design and its use and purpose is 'limited' to discussions and developing ideas e.g. in an exhibition or research context. Nevertheless it is possible to argue for the openness and flexibility of the approach that is free of the bonds and constraints that design normally is surrounded by.

It has been fundamental to the workshop to introduce a new productive design genre and let the participants of the workshop experience its potentials and limitations by working intensively with the approach. Though the critical and relational aspects of the workshop do not guarantee good design results -there still has to be a good designer to make good design -it demonstrates a genre that opens up the field of design by critically discussing our everyday life and actively takes part in it.

For further information on the work of the participants see the workshops website (TRAPS & TRIGGERS).

ACKNOWLEDGMENTS

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EARLY EXPERIENCES FROM AN INSPIRATION CARD WORKSHOP

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INTRODUCTION

In this paper we start out from the position that sources of inspiration plays an important role in a design process, but we claim, often in an intangible way. At the same time small size paper documents are commonly used as an integrated part of various kinds of design techniques and such design artifacts support designers making design moves. We present the concept of inspiration cards as a way of representing, communicating and combining sources of inspiration in the design process. Moreover we report from one of our Inspiration Card Workshops, which has been conducted as part of a project designing digital experiences for a children's literature museum.

BACKGROUND

According to Schön (1983 and 1988) design is a reflective interaction (or in his terminology "conversation") with materials, where the designer works in different media or materials experimenting with various aspects of the design. In the case of information systems design a diverse set of design materials are being used including video, paper documents, mock-ups, prototypes and posters. Moreover, small size paper documents are commonly used as an integrated part of various kinds of design techniques. One category of small paper documents are Post Its as used in for instance Future Workshops (Jungk & Müllert 1987), which makes creation, sharing and grouping of notes easy.

A different kind of small paper documents is cards with pictures or text representing other kinds of design materials. As an instance of this category Buur and Søndergaard (2000) have been using what they label video cards with still images representing video segments and space for annotations to be used as part of collaborative video analysis. In their approach Buur and Søndergaard have found inspiration from the work by Tuder, Muller & Dayton (1993) who have been using card to turn ideas into tangible object.

The video card game is a precursor for the use of cards in a similar way as part of a design workshop where virtual video prototypes has been used, (Bardram, Bossen, Lykke-Olesen, Madsen & Nielsen 2002).

Brandt and Messerter (2004) have been using various kinds of cards in four different types of workshops. In addition to the use of cards for making video clips tangible they have made cards with single words (so called 'sign-cards'), which constitute a conceptual framework for the activities of the design process. In a technology game they used LEGO-Duplo brick with generic functions like 'transfer documents' written on them and taking advantage of the tangibility and the ease at which the bricks connect to each other. From the use of such tangible objects as part of design games Brandt and Messerter (2004) have made the observation that game pieces including the various kinds of cards 'support different stakeholders in making design moves on a conceptual level' (ibid p. 129) and that such design artifacts have become an inherent part of the dialogue, argumentation and way of expressing design moves. In addition it seems evident that the objects at hand help focus the activities of the design activity.

Also, according to Schön (1983), rather than looking for standard solutions, the designer sees the situation as something already present in his repertoire of paradigm cases or prototypes. Though the designer sees the situation as something already present in his repertoire of paradigm cases, he manages to make something new by making experimental moves, which may result in something which goes beyond his initial expectations. One of the renowned examples from Schön's (1979) work is the story about how a group of product developers invented a new kind of paint brush by thinking of the paint brush as a pump. In the area of information systems design Madsen (1994) has explored how metaphors may shed new light on how information technology might be used by seeing a domain of applications as something different, e.g. seeing a library as a meeting place. In a later study based on three cases where digital artist and designers have been working together Lervig and Madsen (2003) have addressed how design materials serve as both examples pinpointing specific attributes and as sources of inspiration serving as jumping-off point for work in a design project.

CONCEPT: INSPIRATION CARDS

We present the concept of inspiration cards as a way of representing, communicating and combining sources of inspiration in the design process. An Inspiration Card is a 2" by 3" cardboard card on which a picture, a title,

a description, and a reference is printed. The card furthermore has an empty box for comments, as illustrated in Figure 1:

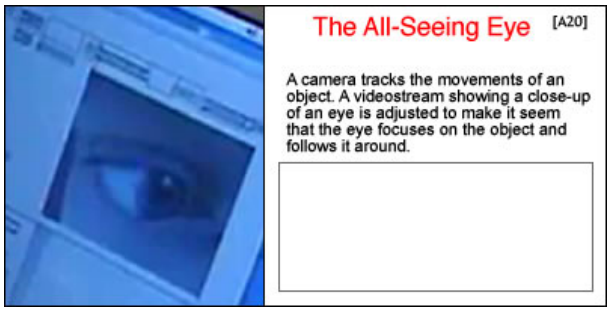

Figure 1: A Technology Card

We make a distinction between two types of cards, namely Technology Cards and Domain Cards. The card in Figure 1 is a Technology Card. It has a picture representing a specific application of a technology (in this case one of our experiments with camera tracking combined with a video stream). It has a title for easy reference ("The All-Seeing Eye") followed by a short description. It also contains a reference to further information on the technology in case. We use Technology Cards as a standard format for storing information on interesting technologies that we have encountered, be they of our own design or by other designers. We have thus created a repository of Technology Cards for ongoing use in our design projects.

Domain Cards contain inspiration from specific domains that we design for. These cards are used for representing ideas, concepts or concrete issues from use contexts that may be unfamiliar to designers. The format of Domain Cards is the same as that of Technology Cards, as illustrated in Figure 2:

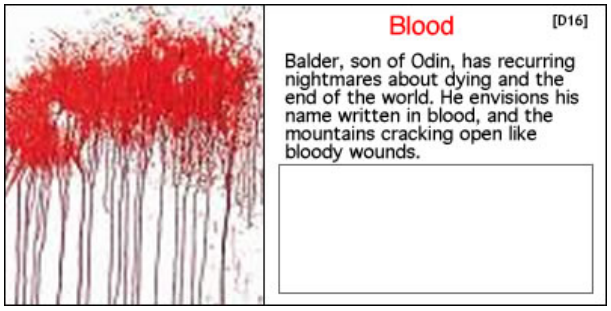

Figure 2: A Domain Card

In this card, the use domain was a project on Scandinavian children's literature, and the concept represented on the card is "Blood", a recurring trope in Norse mythology. Whereas designers usually choose the concepts represented on the Technology Cards, the concepts on the Domain Cards are generally chosen by domain experts. There are thus many subsets of Domain Cards, each of which contains a number of cards with concepts pertinent to a specific domain.

The Inspiration Cards can be used in a number of ways: as a standard for collecting and consistently representing sources of inspiration, as a way to gain an overview of various concepts, as means of communication between designers and domain experts etc. In the following section, we expand on a particular application of the cards, namely the Inspiration Card Workshop.

CASE STUDY: INSPIRATION CARD WORKSHOP

We currently use Inspiration Cards in the ongoing research project "Experience-Oriented Applications of Digital Technology in Knowledge Dissemination and Marketing". One of the domains of use is the above-mentioned children's literature project. In this project, we set up an Inspiration Card Workshop to communicate concepts between designers and experts on children's literature and to develop design concepts. The workshop took place early in the design process after initial meetings between the designers and the literature experts.

Setup

Two designers (the authors) and two experts on children's literature took part in the workshop. Furthermore, two observers recorded the workshop on video and took observation notes. For the workshop, we used 15 Technology Cards and 15 Domain Cards. The Technology Cards were chosen from the designers' collection in advance; the choice of cards was based on previous discussions of the forms of interaction appropriate for the project. The Inspiration Cards were created by the designers for this specific workshop, based on concepts presented in writing by the domain experts. In other words, the designers brought with them primarily technological sources of inspiration, the domain experts brought with them sources of inspiration from children's literature.

The workshop was divided into the following sessions:

Introduction (10 mins)

The hosts of the workshop (the designers) welcomed the guests (the domain experts) and presented concept of the workshop, including the concept of Inspiration Cards, the aim of the workshop, and the rules for using the cards.

Presentation of Inspiration Cards (35 mins)

First, the Technology Cards were presented by the designers. This was done by passing a card around while showing and explaining pictures or video clips of the concept represented on the card. When the participants had questions about a card, they were answered immediately to make clear the concept of the card.

Next, the domain experts presented the Domain Cards by reading aloud snippets from children's literature to set the mood and clarify the situations, stories and concepts from the cards. Both sets of cards were then spread out on a table for all workshop participants to reach.

Combining the Inspiration Cards (50 mins)

As the main part of the workshop, the participants were now asked to pick out cards that caught their interest and combine them in ways so as to generate possible concepts for future design. The rules for turn-taking, choosing cards and combining them were deliberately left open to the participants to decide. In the beginning, the domain experts chose Technology Cards that had caught their interest to express and explain their fascination. Likewise, the designers picked out and commented on specific Domain Cards. This helped to break the ice and get the process of on a positive note. It furthermore invited the participants to actively engage each others concepts and ideas – i.e. the literature experts now had concrete examples of a number of IT technologies that they could grasp and combine instead of leaving it up to the designers and vice versa.

Generally, the pattern of combining cards was that a participant chose one type of card (Domain or Technology Card) and then chose another type of card to support it – i.e. a participant was particularly interested in a story and then looked for cards to realize that story in a design concept, or a specific technology card fascinated a participant, who in turn picked cards for which the technology might be implemented. Often, participants would supplement or interrupt each other; none of the resulting concepts were thus the work of a single creator, but rather a collective effort.

Figure 3: Combining the cards

When a concept had been presented and seemed relatively stable (i.e. when no new cards were added), the combined cards were glued to a poster and drawings or small snippets of text were added to explain the concept. On several occasions, blank cards were filled out and used to add new concepts to a poster.

Evaluating the results (10 mins)

After an intense phase of generating concepts, the participants took a step back to evaluate the resulting posters.

The process had resulted in eight design concepts. These concepts were loosely evaluated by comparing their potential; no concepts were immediately disqualified, rather they were all photographed and photocopied for each of the participants to keep for further design activities.

Figure 4: A poster with cards combined togenerate and capture a design concept.

DISCUSSION

In this short paper, we have described our early experiences from using inspiration cards in a single design workshop. The feedback we have received from the two experts on children's literature, who participated in the workshop, has been very positive. The inspiration material and the inspiration cards have clearly stimulated an innovative and productive process, and we have made the observation that the design concepts developed hold a suitable balance between being innovative and realistic to implement. However, when presenting specific uses of technology as source of inspirations there seems to be the pitfall that the domain expert would like to have exactly the same solution as represented by the technology card.

The quality of the documentation of the design concepts developed seems to be an obvious place for improvements and from a different inspiration workshop with around ten participants we have got the experience that by splitting the participants in two teams, who are to present their design concepts to the other team at the end of the workshop, people are not only more productive but also end of with elaborate and well documented design concepts.

Based on our initial experiences we continue to experiment with the workshop format in order to incorporate these findings and iteratively improve this design technique.

We are furthermore looking into ways of technologically supporting the method, both with regards to the inspiration card workshop and the creation, storing and sharing of the inspiration cards throughout the design process. One possible avenue to pursue in this regard would be to combine a database for inspiration card storage and sharing with input devices and displays for use during the workshop, like the Video Wall presented in Jensen, Buur & Djajadiningrat (2005). However, the current "low-tech" solution has proved successful at yielding ideas and concepts, and the implementation of digital support for the method could possibly hamper the creative, explorative and collaborative process that the current workshop format supports.

As previously noted, the inspiration cards have a range of applications in the design process that goes beyond workshops. We are currently in the process of exploring such potential applications, one of which is to use the cards as a standard means of representing and communicating sources of technological inspiration as well as key findings from field studies. As our repertoire of Technology and Domain Cards expands, we plan on typologically classifying the cards into subsets. In regards to Technology Cards, this will

generate an overview of state-of-the-art experience oriented applications of IT. A typology of Domain Cards will support comparative analyses of recurring patterns across domains.

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FASTTRACK SCROLLING: A FASTER AND MORE SATISFYING SCROLLING INTERFACE FOR WEB BROWSERS

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INTRODUCTION

A study by Byrne (1999) showed users to use a considerable amount of time on reading while browsing the Web. One sub task when reading is scrolling and the study showed that in five hours of browsing 40 minutes where spent scrolling. A better scrolling interface thus may considerably increase the general usability of a web browser in reading tasks. I here present a new scrolling interface called Fasttrack Scrolling the design of which is based on insights from classic introspective psychology concerning human attention and habit formation. I have experimentally examined whether Fasttrack Scrolling is more efficient and satisfying than the scrolling interface of Microsoft Internet Explorer (MSIE).

CONTEXTUAL STUDY

To find ways of improving the currently used scrolling interfaces I made a contextual study (Beyer & Holtzblatt 1998) with eight users chosen to represent a broad cross section of web users. In the study I had a special focus on reading patterns in the users' reading of web documents since these patterns determine in which ways it is necessary to do scrolling. In the context of reading patterns I studied use of scrolling interfaces and analyzed potential problems with the interfaces.

Reading Patterns

I observed four reading patterns that are characteristic in the context of scrolling - all other reading patterns I observed where combinations of these four basic patterns. The patterns I have named linear reading, headline reading, skimming and jump reading. In *linear reading* users sequentially read a long block of text meanwhile they may be scrolling, or alternatively they can interchangeably be scrolling and reading. In *headline reading* users

are scanning through headlines (or other distinct parts of a document) and it is here characteristic that the user never knows how far it is necessary to scroll until the next headline. *Skimming* is like linear reading with the difference that faster scrolling is required and with the difference that it may not be possible to scroll as fast as the user is able to read downwards because faster scrolling may make reading more difficult. In *jump reading* users jump directly to one end of a document to read a specific part of the document which he knows is placed there. In connection with scrolling this is characteristic in the sense that the user is not reading the document while scrolling. It is also characteristic that it may be necessary to change the scrolling direction and scroll a bit back in order to see the top or bottom of the specific part of the document.

Scrolling in the user studies

The scrolling techniques primarily used were the well known scroll wheel mice and 'thumb dragging' where the thumb of the scroll bar is dragged with the mouse. The users with scroll wheel mice used the wheel while reading linearly and skimming slowly. When they needed to do faster scrolling as with headline reading, jump reading or fast skimming they, however, often turned to thumb dragging. For users without a scroll wheel mouse thumb dragging was the primary mean of scrolling. Only seldomly did users use any of the many other scrolling techniques that are supported by the scrolling interfaces of their web browser. Users who primarily used thumb dragging however sometimes switched to using the arrow keys of their keyboards to do per-line or per-page scrolling when reading long documents.

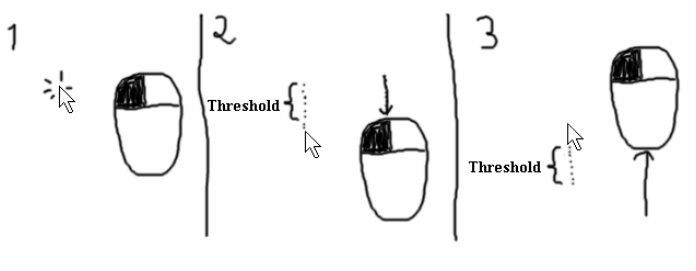
Problems with the scrolling interfaces

One problem with today's scroll wheel mice - and per-line scrolling - is that that scrolling is performed rather coarsely. For each notch of the scroll wheel or each per-line scrolling the document is often scrolled somewhere around 10% of the height of the window showing the document. A study by Klein & Bederson (2005) indicates that this may make a significant disruption on reading when reading linearly. With thumb dragging in smaller documents it is possible to perform scrolling more accurately. Interacting with the scroll bar to do thumb dragging however often requires direct visual attention to 'grab' the thumb and it also requires coordinating a steady movement of the mouse to acquire a certain scrolling speed. In addition to that, with headline reading and fast skimming dragging the thumb fast, and thereby scrolling fast, makes reading the document more

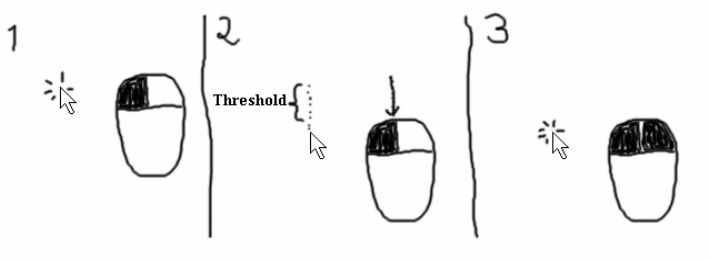
difficult, as observed by Igarashi and Hinckley (2000). A problem with thumb dragging also is that it becomes less accurate the longer the document. Moving the hand to the keyboard to do per-line or per-page scrolling is problematic since the mouse is the primary mean by which users point to links which is done very often.

FASTTRACK SCROLLING

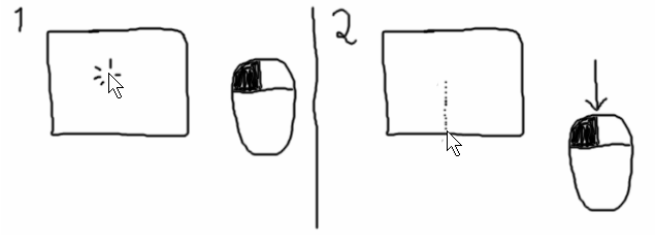
I designed Fasttrack Scrolling with the aim of supporting all four observed reading patterns in a way that requires fewer resources of the users than their current interfaces. Fasttrack Scrolling provides three scrolling techniques that are each to be used with different reading patterns, and to support combinations of reading patterns it is easy to switch between each scrolling technique. With Fasttrack Scrolling all scrolling is performed in a 'quasi-mode', i.e. a system mode that is maintained by the user. This quasi-mode is entered by pressing the right mouse button while the mouse pointer is anywhere in the window that displays the document, and exited by releasing the button. When moving the mouse pointer downwards or upwards while keeping the left mouse button depressed *automatic per-pixel scrolling* is activated. Anytime during automatic scrolling the user can click the left mouse button thereby speeding up the scrolling until three fourths of the height of the window has been scrolled - this I call *per-page scrolling*. The sped up scrolling is performed very fast and to help the user not to get too disoriented Fasttrack Scrolling uses a special visualization of a three pixel wide horizontal blue line. This 'scroll line' is shown during and around one second after the sped up scrolling and indicates to the user which parts of the document were, and were not, visible before speeding up. The third scrolling technique - which I call *jump scrolling* - is to move the mouse pointer to the bottom or the top of the screen (still maintaining the quasi-mode) thereby scrolling directly to the bottom or top of the document.



Automatic scrolling. 1) Left mouse button is pressed. 2) The cursor is moved downwards or upwards over a threshold of a number of pixels while the button is kept depressed. 3) To change scrolling direction the cursor is moved in the opposite direction over a threshold of the same number of pixels while still keeping the button depressed. The automatic scrolling continues as long as the button is kept depressed.



Per-page scrolling. 1-2) Automatic scrolling is started. 3) Right mouse button is clicked while left mouse button is kept depressed and for every click the automatic scrolling is sped up until one 'page' has been scrolled.



Jump scrolling. 1) Left mouse button is pressed. 2) The cursor is moved to the button or the top of the screen thereby scrolling to the top or bottom of the document.

Discussion of the Fasttrack Scrolling design

Fasttrack Scrolling has the advantage of scroll wheel mice that it requires minimal attention to activate scrolling. Fasttrack Scrolling though avoids the

disadvantage with scroll wheel mice in connection with *linear reading* - since scrolling is performed per-pixel the user can continue reading while scrolling instead of being disrupted by coarse scrolling. In comparison to using thumb dragging with linear reading the automatic scrolling also does not require resources to coordinate movement of the mouse and the scrolling does not become less accurate with longer document. With Fasttrack Scrolling's per-page scrolling reading is also not made more difficult by fast scrolling during *headline reading* or *fast skimming*. The idea is that the user will interchangeably scroll one page and scan the document instead of trying to scan the document while scrolling as might be done with thumb dragging. Reading will thus not be made more difficult by scrolling and each per-page scrolling may be done much faster than scrolling by dragging the thumb because it is not a limiting factor that it needs to be possible to scan the page meanwhile. In comparison with per-page scrolling with the users' current interfaces - which is also possible with the Page Up/Page Down buttons or by clicking in the scroll area of the scroll bar - Fasttrack Scrolling requires less attention than using the scroll bar, does not require the user to move his hand to the keyboard, and the scroll line presumably helps the user from becoming disoriented. With *jump reading* Fasttrack Scrolling gives the advantage of jumping directly to an end of the document without requiring the user to grab the thumb and do the dragging.

In the design of Fasttrack Scrolling I found help in Raskin (2000) and Frøkjær & Hornbæk (2002) who based on the findings of classic introspective psychology make certain design recommendations. One important finding is that humans have a very limited 'locus of attention', i.e. the attention can only be pointed directly towards one sensual impression at a time. Humans therefore have a limited ability to perform more than one task at the same time. However, through habits it becomes possible to perform some tasks 'automatically', i.e. without direct attention. Fasttrack Scrolling seeks to exploit this ability so that the user can perform scrolling without dragging attention from the primary activity which is reading. One way this is achieved is to not require the user to point to small areas of the screen. Another way it is achieved is by avoiding the use of modality which under certain conditions requires a lot of attention and also causes errors (Raskin 2000). To support fast habit formation I have used Raskin's principle of monotony, i.e. the principle that any one functionality should only be accessible through one mean.

EXPERIMENT

To examine whether Fasttrack Scrolling is really an improvement over the currently used scrolling interfaces I conducted an experiment.

Experimental design

The experiment involved six of the eight users from the contextual study and had the scrolling interface as an independent variable. The experiment had a within-subjects design where all users solved four tasks each three times in a row. Besides Fasttrack Scrolling the users used the scrolling interface of Microsoft Internet Explorer (MSIE) which supports the scrolling techniques I observed being used. To even out learning effects, or the effect of being exhausted, half of the users first solved the tasks with Fasttrack Scrolling and the other half started with the MSIE interface. The scrolling interfaces where incorporated in a 'pseudo browser' which for each task and repetition thereof generated documents for the users to read. The tasks where to read aloud randomly generated numbers in the interval [0;9], and the numbers where placed in the documents so that reading the documents from the top or bottom made the users read in each of the four patterns.

Discussion of the experimental design

With documents containing numbers instead of text I could control that two documents where exactly equally hard to read if they needed to be, and for skimming I could control exactly which parts of a document would attract the user's attention. Thereby I could get a very accurate measurement of the differences in use of resources between the two scrolling interfaces because the measured differences are surely not caused by differences in how many resources are spent on reading. And because all numbers are placed in a vertical line I also did not have to burden the users with horizontally reading of lines which in the context of scrolling is less interesting. Finally this sort of abstraction of the reading tasks also made it possible to magnify the effect of the interfaces, e.g. in connection with headline reading - in a real context headline reading often does not occur through many headlines but in each test of the experiment users had to read five 'headlines'. The choice of numbers instead of text however makes it impossible to get any meaningful measurement of the effect of reading such as how well a document is understood. But it is reasonably safe to expect that the effect at least will not be worsened if less resources are used on scrolling and the user is still able to read all parts of the document (aloud). This of course needs to be experimentally tested.

Results

In the experiment as in the contextual study users primarily chose to use thumb dragging. Users with scroll wheel mice (three users) however chose to use the scroll wheel for linear reading. In the experiment I observed that the users where in fact in all cases able to read the documents aloud with reasonably few errors (<2%, errors counted as number of numbers that where overviewed or read wrong). The effect is therefore the same for any measured use of resources. I used completion time and user satisfaction as the primary indicators of resource use / efficiency. The following table shows my measurements.

Scrolling interface	Linear reading	Headline reading	Skimming	Jump reading
Fasttrack	4 / 75148	5 / 17788	2 / 23165	4 / 3205
MSIE	1 / 83553	0 / 22620	3 / 28799	1 / 5367

Number of users who liked the interface better / Mean of the users' mean completion times in milliseconds.

According to a Wilcoxon Rank-Sum Test it is 99,6 pct. certain that there is in fact a difference between the two interfaces regarding the completion times. For the experimental tasks there was a mean difference in completion times of 5258 ms / 32,5 %.

CONCLUSION

This study revealed four basic reading patterns which must be considered in the design of scrolling interfaces, and it also shows that the scrolling interfaces currently used in web browsers may very well be improved for reading tasks. My experiment reveals Fasttrack Scrolling as one promising way of doing this and also confirms the importance of considering human attention and habit formation in designing interfaces. To gain a better understanding of how Fasttrack Scrolling affects usability, including the effect of reading, more realistic experiments must be done. It is my hope that Fasttrack Scrolling can in general help improving reading of electronic documents which is an increasingly important but also inherently problematic task (Hornbæk & Frøkjær 2003). It must be examined if Fasttrack Scrolling is, or can be made, more generally usable.

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USING PERSONAS TO GUIDE ITERATIVE DEVELOPMENT

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INTRODUCTION

In this paper, I introduce the use of personas to guide decision-making in the agile development methodology of eXtreme Programming (XP). The use of personas is a User-Centered Design (UCD) tool that allows the development team to engage in- and understand the minds of fictional users. A connection between the user stories of XP and personas of UCD is the link between XP and UCD.

First, XP and UCD are each introduced and compared, where after relevant critique from the literature is reviewed. Further, it is examined how the two can complement each other to form a new approach, which combines the two.

EXTREME PROGRAMMING

Extreme Programming (XP) is an explorative and agile development method[1] that seeks to satisfy the customer through early and iterative delivery of valuable software. XP welcomes changing requirements through the whole development process by being flexible with its short iterations (2-4 weeks), that allow rapid feedback, and tools like refactoring[2] and unit testing, that allows simplistic coding[3]. Together, this steers the project in the right direction, which in turn decreases the risk of failure[4].

XP is based on old and proven practices combined in a new way to make up for weaknesses in the more traditional phase-divided methods like the waterfall-model. XP swears to the principles of the Manifesto for Agile Software Development[1], which represents the thoughts behind XP:

- Individuals and interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation

- Responding to change over following a plan

User stories

The customer starts the project by presenting the complex problem domain to the development team. The problems to be solved are divided into smaller bits of functionality called user stories, which can each be implemented in the time of one or two iterations. A user story is a one to two sentences long description of the specific functionality. An example of a user story is:

"The system should check the spelling of all words entered in the comments field." [4], p. 14

In the beginning of each iteration, a planning meeting is held. Here the user stories, which are to be implemented in the oncoming iteration, are chosen. The prioritization of user stories is based on what user stories bring most value to the project as well as an estimate on how long they take to implement.

USER-CENTERED DESIGN

UCD places the person and not the system at the center, by trying to answer questions about the goals and tasks of users, in order to direct the development and design of a product. The final product can be a physical product, a software product or even a process: anything with which the users interact. One UCD technique is a plain evaluation of an existing system – another, writing personas, is a detailed way of describing the product's users.

UCD in itself has no plan for implementation, as it is just a set of tools, which all bring the user to the center of design.

The UCD toolbox is large, but a few select techniques are appropriately combined with XP. These techniques go along well with the principles behind the Manifesto for Agile Software Development. Especially personas[5] and the complementary scenarios[5] were found to be directly connectable to work within the iterative XP development loops.

Personas

Personas are specific and realistic written descriptions of archetypical fictional users. The personas serve as a communications tool to explain and end design discussions.

The developers design for some personas more than others, why arguments from the perspective of one persona can have larger weight than from the perspective of a less important persona. A few personas can even be created to define whom the designers should not design for.

CRITIQUE OF METHODS

Extreme Programming

When Kent Beck originally introduced XP's customer, a real end-users was in mind, as he believes in the team's direct accountability to the end-users. Unfortunately, not all XP projects have followed this model. The broader picture with multiple end-users was cut away with the big initial requirements analysis and degraded to fit under the hat of the "customer", who makes business decisions as well as represent the end-users. Even though many advantages have been achieved by the new structure, a new problem has been created: end-users are not represented in their diversity and detail in XP.

User-centered design

Most user-centered design tools wish to give an answer to the whole solution of the problem up front. When the solution to the design-problem is created, implementation of the solution is estimated. The estimation leads to the allocation of a fixed time-slot and a fixed amount of resources for developing the solution to the design problem. This shows a focus on defining scope from the start of the project that is not found in XP.

Lene Nielsen explains[5], that a main obstacle with using personas is poor description of the step from personas to code. This paper seeks to do give a description.

Comparing XP and UCD methods

The mentioned characteristics of XP and UCD have been summed up in Figure 1 to provide a clearer view of the differences in the principles behind respectively XP and UCD.

	XP	UCD
Design	Iterative delivery af design	Up-front design
Changing requirements	Embraces changing requirements	Neglects changing requirements
Focus	Quality	Scope
Choice of functionality	Most value to the system.	The found solution that solves the problem.
Testing	Continuous unit- and acceptance testing	Test in the end
Documentation	No written documentation. Real-life customer/user serves as documentation	Designs up-front in written requirement documents
Planning	Evolving plan: responding to change.	Fixed plan: trust in up-front solution

Figure 1. Characteristics of traditional XP and UCD

BRINGING THE USER CLOSER TO XP

Among UCD and XP tools, I found that the best match for combination between UCD and XP was between personas[5] from UCD and user stories from XP.

Matching personas with user stories

Personas can serve as an expansion of the user representation within the XP methodology, support arguments about features of the system[5] as well as helping prioritize between them[6]. As each XP user story describes a feature, the mating between personas and XP seems obvious.

Programmers and decision-makers can engage in the worlds of the persona by understanding the motivation for actions done by the persona. This is why personas can make up for the lack of focus on the user in XP and make XP more user-centered.

Personas require field study of the target user group that the personas should represent. If done thoroughly, this field study takes longer than the length of

an XP iteration, and should therefore not take place inside an XP iteration loop, but before the loops begins.

Implementing personas with XP iterations

In traditional XP development, it is the customer, who makes the business decisions on what is to be implemented in future iterations of development. I suggest letting the personas and their complimentary scenarios play a part of this role. Needs, goals and personalities of the users as well as financial considerations should be used to evaluate which user stories (features) are more important than others.

A solution for prioritizing between user stories is to rate each story by how much value they bring to each persona as well as the financial backup. The rating should be friendly to the budget and consider that even though one user story may be more valuable to the biggest amount of users, there is only enough money to implement a user story that is half as valuable. Another consideration is that one type of user might bring in more value than the other types of users. All considerations should therefore have separate weight in the decision-making.

The user stories are short. This makes it possible to cope with many user stories (features) when making a decision on which stories to implement and how long it will take to implement them.

The users' wishes are elaborated for the decision-makers at the planning meetings through personas. If we for instance have 4 different personas and a user story is only highly prioritized by 1 persona, we might choose to find another user story that has a broader prioritization among all 4 personas. In other words, we can use the personas both as a tool to establish a common understanding of the user group, but also as a tool for the project coordinator to prioritize between user stories.

When user stories are created in XP, the customer creates scenarios along with them. These scenarios are different from the UCD scenarios that are usually built from personas, as they are used for acceptance tests at the end of each iteration. These acceptance tests contain small steps of interaction that can determine whether a user story has been implemented the right way or not. To test whether an implemented user story fits the needs of all personas, acceptance tests can be created for each persona.

Testing the method

The new approach was tested in a series of workshops with students of a HCI / systems development class (Consumer Oriented Systems

Development) at Copenhagen Business School. The students had no prior experience with either XP or UCD and were not experienced programmers. They were introduced to the UCD tools and XP used through the HCI / systems development class.

The workshops, which took place every week over a time span of 4 weeks in the spring of 2005, included brainstorming for new user stories (features), release planning (rating user stories from the perspective of each persona and the customer), and acceptance tests. Release planning is where the use of personas had the biggest impact:

Release planning

The resulting list of user stories at the release planning could look like Figure 2.

To figure out which user stories to implement in which iteration, each user story was scored in importance by each persona. Zero was given in score if the persona had no interest in the user story, 1 if the story had some value, and 2 if the user story would do something important for the persona. The scores were then added up for each persona and soon the user stories with the highest priority were found.

	Persona 1	Persona 2	Customer	
Weight:	20	30	50	Weighted sum
Show how long the movie is	2	2	0	100
Show link to trailers	2	2	2	200
Gift cards	1	1	2	150
Drinking games for films	1	-1	1	40
Free simple games	1	2	2	180
Etc.	-	-	-	-

Figure 2. Example of how user stories were prioritized in planning meetings.

After evaluating the first workshop, it was found that there needed to be some voice of the financial backup of the project. Therefore it was decided to add another point-giver called “the customer” that could also score each

user story from 0 to 2. After reviewing the literature, it was found that Jonathan Grudin and John Pruitt[6] had already done something similar before. Ideas from their priority matrix resulted in adding a -1 to the score if the persona or customer was confused, annoyed or harmed by the feature as well as adding weighted scores so that opinions from either one persona or the customer would weigh more or less than the others. The sum of the weight should be 100. That means that if everybody approves the feature and rates it 2, the sum would be 200. If the feature harms everybody, the sum would be -100.

The weight of each persona and the customer was determined by a discussion in the student group. The specific rating of a user story is based on arguments that might not have any connection to the rating of another user story. For this reason, it is important to underline, that the sum is not a definitive tool to find which user stories to implement in the next iteration, but merely a guide to help in making the decision. Adding comments to the difficult-made ratings can further help the final decision-making.

The top 20 rated user stories were chosen for further investigation. It was then decided which user stories were to be implemented in the next iteration among these regardless of their scored sum, but instead based on a human judgement of what seemed more important to implement first.

REFLECTIONS

The new method has solved some of the problems that XP had when not using contract development as well as problems with XP in general. Problems solved include too little focus on the actual users of the system. For the method to be able to run perfectly smooth, some problems need to be addressed: some that are present in traditional XP and some that has hit the surface with the introduction of this new method.

Problems still present from XP

The number one problem in the workshops was the process of concretizing visual design ideas into user stories. The participants requested some sort of tool, which could help concretize the visual design ideas in the time of one iteration. It was a frustration over how important a good user interface was rated in the theory, and how hard it was to use the theory in practice. The participants did not have the experience in designing user interfaces and could not engage in the personas enough to know exactly what concrete ideas the personas had about the design.

New challenges created by the new method

At the start of each planning meeting, the participants had fresh minds. Details of the discussions that went on at the prior planning meetings were forgotten. This resulted in the user stories being rated differently from meeting to meeting. Unless the details had been written down in details in the rating-comments, the rating of each user story had to somewhat start over. Whether this was due to new knowledge of requirements is not clear. A user story that had top ratings could easily go from a 1st to 30th place in overall rating. With numbers for ratings, and only two personas to make a difference, it is not much that makes the difference. A solution to this problem would have been to introduce more personas in order to get a more detailed overall rating.

Rating user stories with importance for each persona and customer follows a market perspective. As mentioned before, user interface stories are rated very important by the theory, but did not necessarily have a top score between other features. This can be explained by the example that getting the system up and running is more important than the font-headers being colored blue.

CONCLUSION

The use of personas to prioritize between user stories has proven to be an effective combination of UCD and XP. The conflict in interests the XP customer has in traditional XP development; by both representing financial interests of the client as well as the interest of specific end-users, has come closer to a solution. The customer, who in XP speaks the voice of all end-users, has been elaborated to include a more detailed picture of the different end-users.

The method is still agile, but is so in a more detailed sense. The different personas each represent different directions the project can go, thus the risk of missing out on certain end-user problems has been minimized.

XP has been expanded to take more organizational problems into considerations with the personas. There has been a shift from XP's focus on the system to a more equal focus on both the system and the users.

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"THEN THE PICTURE COMES IN YOUR MIND OF WHAT YOU HAVE SEEN ON TV" – A STUDY OF PERSONAS DESCRIPTIONS AND USE

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INTRODUCTION

When working with the method personas there might be a difference between designers knowing people similar to the personas or designers not knowing any. An ongoing study reveals that when designers have knowledge of the users from site visits and user tests, they form a broader understanding of the persona where the persona is perceived and referred to as a bricolage of multiple persons, defined by roles, but spoken of as a single person. If they do not have this kind of knowledge, they draw on other sources to perceive the persona, in this case a stereotypical fictional character from a TV-soap. An earlier study showed how the creating of a stereotype prevented the designers to adapt new information that did not fit the stereotype. This paper investigates what kind of information triggers the inflexible categorization of functional typification and looks at the role of informal discussions.

THE STRANGER

When we encounter a stranger we do not see the person as possessing a unique constellation of characteristics, but add the person to a previously formed category (Macrae & Bodehausen, 2001). The result might be a stereotype, or as Hinton defines it as "socially constructed representations of categories of people" (Hinton, 2000). The stereotype is built on expectations to typical behaviour (Schutz & Luckmann, 1973) and ordered into categories that form the basis for the stereotype.

To describe the user as a persona enables the design team to engage in the user and to focus the design on the potential user, but the descriptions can conflict with the preconceived perceptions the designers have. A recent and ongoing study shows how the designers who have not met users similar to the persona, has to resort to a fictitious character from a TV-soap to

understand the persona. The designers who have met users similar to the persona are able to form a broader understanding of the persona and are able to adjust the static persona description into a dynamic informal description that includes multiple roles and multiple cultures. This is done in discussions, but does not enter documents or get included in the personas description even though company procedures make this possible. Being informal it might be difficult for others, who did not partake in the discussions to obtain the same deep knowledge of the domain that could broaden the understanding of the persona.

THE STUDY

I have, in a Danish branch of a large international corporation, conducted three interviews with five persons involved in redesign of User Interfaces. The interviews lasted between 45 and 90 minutes. Two interviews were audio recorded and one videotaped. The tapes were listened through and partially transcribed. For reasons of privacy I name the interviewed A, B, C, D and E. The interviewed refer to the personas by their names, while I rename these Sophie and Mike. Both personas were used to redesign the same system.

FIELD DATA AND THE ACT OF COMMUNICATION

Usually the field data for personas has focused on behaviours and demographics (Goodwin, 2002) or goals and tasks in work related environments (Carroll, 2000). Other types of field data has been introduced (Nielsen, 2004) including information such as; background, psychology, emotionally status, and character traits. The advantage of the method is its ability to support tangible communication about the users grounded in ethnographic material. The foundation document (Pruitt & Grudin, 2003) is an example of a recommendation of what should be included in a material that supports the perception of the personas, but the choice of material does not reflect the process of perceiving the material. A study of how we perceive and categorize others might help to support the transition from field data to the perception of the persona.

The creative process of writing personas is grounded both in the writer's previous experiences, the field data, the media, and the writer's ability to write. To introduce field data to designers is an act of communication that involves both a selection of the data to present and the form in which it is to be presented. During the presentation the presenter must be aware of how the data is received and interpreted. As human beings we have a tendency to

stereotype, to "categorize persons to reduce them to an entire class (e.g. fat people, depressed women, or post office workers), and let the reader assume the rest." (Edelstein, 1999) The stereotypes function as mental pictures for the developers, but being stereotypes they prevent an alignment with the personas. In an earlier study (Nielsen, 2003) I reported how designers created stereotypes that prevented them from adapting field data as it did not fit with their categorization of the persona. The perception thereby influences the value of the personas and scenarios as means to investigate and describe a possible future solution. With an awareness of this tendency the presenter might be able to support designers to see the persona as other than a stereotype and get the designers to fully understand the world of the persona.

The designers without knowledge from site visits

Similar to studies of written description (Strøm, 2005), where the readers compare narrative descriptions to their own experiences, this study shows that when we read a personas description, we start to compare the description to people we know.

The strategy used by the designer who had not met real life users where to get an understanding from something close at hand - a TV-sitcom

E: "I saw a power-point about his homepage, so you see these words: warehouse, put away, fork lifts. Then the picture comes in your mind of what you have seen on TV, guys, I don't know if you have seen this, "The king of queens", it's some American sitcom, it's not my favourite show, but that guy now is in my head. And he's not some warehouse guy, he's some delivery guy, that's what I see.

I: That kind of guy? So you immediately thought about him, when you were introduced to Mike and his work and his?

E: Yes because what we see is power points without pictures of anybody, we just see the words: homepage, forklift and dring [imitating sound of bell] and then this image comes up."

As the information focus on work-related areas, the designer created a stereotype from the information presented supported by information from fiction. Both the power point slides presented and the TV fiction are sketches of persons or mental pictures. "Stereotypes seem to work best when characters are not created to be deep, but only to be a mental picture". (Edelstein, 1999). For the designer without knowledge from site visits the more emotive information was missing, E.: "That is the kind of information they [the document writers] do not include, how they like to work." This

understanding of the persona relates to what Schutz (Schutz & Luckmann, 1973) refers to as a "functionary type". The functionary type is anonymous and characterized by an understanding of typical behaviour; an institutionalization of situations that might not reflect real behaviour. It is a generalization of social reality that is relatively general and empty of content. In contrast an immediate experience that originates from earlier more intimate encounters with persons (fellowmen) are relatively detailed and filled with content, which allows for variations in situations. The way the information was presented to the designers – power point, pictures of trucks - might support the institutionalization of situations, while unexpected information, information that enables comparison to people familiar to the designers, or information that does not belong to the expected might help create variations in situations.

The designers with knowledge from site visits

The designers I interviewed who had knowledge from different sources of the users they were to design for compared the descriptions to their own understanding of the users.

B: "I was familiar with the (…) role, but it [the persona] gave us a little more, but I saw things that didn't fit in with our Sophie."

To use the persona as a tool, the designers discussed the persona and decided what extra material to include in the design process. Instead of a uniform persona, the persona became a bricolage of different personas referred to encounters with many persons and included differences in roles and in culture. Several designers emphasized that they had observed differences in the level of education between Europe and the States and as a consequence of that, differences in how independent the work tasks were performed.

A: "The description, it was very general. It was almost as if they had interviewed many Sophie's and compiled it all into one. Which made it not very realistic, as not every Persona 1 does what every other Persona 1 does. And a lot of it was from our general knowledge from Persona 1s' we had interviewed and visited on sites and even had in on usability tests. So that gave us an ability to take it in and decide that this is just a generic persona. We all discussed it all"

Even though some of the designers view the persona method as dynamic, as an ongoing development of user understanding with more than one way of communicating the persona, these observations are not included in the

personas descriptions and as a consequence might not be passed on to new designers not familiar with the users.

D: “I think what is positive is for instance that within Mike, we have these four to five pages descriptions about who Mike is, as persona, but also maybe 30 different links we can use if we want to look up something about Mike in a report. So it is possible to get the background information.“

For the designers with knowledge of users the power point slides was sufficient to understand the world of the persona and a preferred way of communicating about the persona and they are able to compare the information with people they have met on site visits. The designers’ descriptions were detailed and filled with content, which allowed them to come up with variations in situations of use.

CONCLUSION

In this study each persona includes multiple roles and the designers see the advantage of the methods in its ability to focus conversations about the users in concrete terms. The conversations help the designers to align their understandings and align their common understanding to their impressions from site visits. In the company new findings are added to the documents and it is possible to ask for updates by contacting the persona owner and make updates. The impressions that are aligned in discussions are not considered findings in a strict sense, therefore not considered worthy of being added to the documents. Instead they become group internal adjustments not added to the personas descriptions.

The designer without experiences from site visits will use two strategies: to form a category that originates from the presentation of the material, which might be difficult to adjust later. The designer will also try to absorb the internal adjustments that are not documented. The success of this strategy depends on the initial formed category. For the designers without knowledge of users the initial material presented will influence the forming of the category. If the designer should be in a position to create an understanding of the persona that is as broad as the bricolage of multiple persons, the initial material presented should reflect the bricolage and suppress the categorization. A way to access this might be to include informal material both in the documentation and in the initial presentation, material that is not considered findings, which reflects the discussions and include the anecdotes and the impressions from the people who have been on site visits.

Future work will look into if photos, videos, anecdotes, unexpected information, or selected characters from fiction that are familiar to the designers can support the perception of the persona.

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DEALING WITH REALITY - IN THEORY

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INTRODUCTION

Within the field of HCI, methods such as personas (Cooper, 2004) and scenarios (Carroll, 2000) are increasingly used in product development. In this paper, I introduce Roger Barker's behaviour setting theory as a next generation method, as it provides a complete framework for investigating and describing user behaviour especially in relation to mobile contexts. Characteristic of personas and scenario methods are that they investigate and describe real world user behaviour. This approach coincides with a renewed interest in theory within the field of ecological psychology that focuses on the relation between context and behaviour in the real world. The theoretical approach is Roger G. Barker's behaviour setting theory (Barker, 1968). The paper outlines Barker's "new" theoretical approach and, on this basis, the paper presents an analysis of the strengths and shortcomings of the personas and scenario methods.

THE REAL WORLD AND THEORY

Painting a realistic picture of user behaviour and user needs and applying this knowledge in a product development process is by no means a simple task. Within psychology there is at the present time not a separate field concerned with HCI. Psychological theories and methods applied in HCI are usually solutions adapted from fields like for example cognitive psychology, general psychology (for example activity theory) or ecological psychology. Of these fields the paper will focus exclusively on a somewhat forgotten theory of ecological psychology.

Ecological Psychology

The field of ecological psychology has its origin in the scientific distinction between the world of the laboratory and the real world outside.

The most widely known representative of this field is James J. Gibson with his theory of visual perception (Gibson, 1986). Gibson recognized that real

world or ecological visual perception has a unique structure that could not be described on the existing scientific and laboratory-based terms. Especially his concept of affordance has drawn attention as well as discussion in the field of HCI (Bærentsen & Trettvik, 2002)

Roger G. Barker's work and theory are motivated by the same distinction between laboratory and the real world even though it is a theory of social psychology and not perception. Barker made the distinction between the instructed behaviour of children observed in the laboratory and the natural behaviour of children observed in their normal everyday environment and based his theory on observations of children's daily lives (Barker, 1968).

Behaviour Settings

The key point in Barker's theory is that real world behaviour has both structure and pattern that are available to an observer. Barker and his associates have developed a theory, describing this structure, through extensive empirical studies of children's behaviour in their daily environment. The studies have shown, that the context, known as a behaviour setting, determines a person's behaviour. Barker's theory of behaviour settings is therefore focused on the relationship between person and context (Barker, 1968).

According to Barker: "A behaviour setting consists of one or more *standing patterns of behaviour*.[…] It consists of standing patterns of behaviour-*and*-*milieu.*" (ibid., p.19)

A pattern of behaviour is the bounded pattern of behaviour that can be observed at for example a basketball game, in a school lesson, etc. Milieu is the non-behavioural part of a setting and can be natural as well as man-made. Its components are times, places and things. The milieu so to speak surrounds the behaviour. It is a defining feature of a setting that the elements within the setting have stronger connections to each other than to anything outside of it (ibid.).

When Barker emphasizes that a behaviour setting has both a behavioural and an environmental component, it means that they are to be considered equals. An important characteristic of behaviour settings is that they are extra-individual units, meaning they exist independently of individual persons (ibid.).

Shifting to the perspective of the individual, any given person can according to Barker's theory be described as having a stream of behaviour. As a person moves through behaviour settings, the stream of behaviour is an unbroken chain, which consists of a myriad of behavioural episodes that are

told apart by shifts in goals and actions. An episode has one goal that the action is directed towards meaning it has a constant direction. Episodes are subordinate behavioural units, in the sense that, among themselves, they are individually different, but seen as a whole they contribute to attaining a given goal (ibid.). Sharpening a pencil before writing with it during a school lesson is a behaviour episode that is very different from reading a text on Shakespeare, but both are directed at attaining a mutual goal.

How can the theory of behaviour settings contribute to HCI?

Firstly, behaviour setting theory consists of both theory and methodology which allows for a scientifically structured approach to the investigation, and importantly, the description and understanding of behaviour.

Secondly, then the concept of behaviour settings is ideal for understanding user behaviour in mobile contexts, because it is a basic assumption of the theory that behaviour is shaped by the variety in behaviour settings.

Thirdly, another relevant basic assumption is the strong connection between behaviour and objects in a given behaviour setting that also includes the physical layout of the setting.

And finally, due to the focus on the setting, the theory goes beyond intrapersonal factors and the individual as main causal factors.

Personas and Scenarios

When taking a look at the personas method (Cooper, 2004) from the perspective of behaviour setting theory there are several similarities.

A persona is a fictitious user constructed as a generalisation of information collected from several users (ibid.). Its purpose is to represent and communicate knowledge of user tasks and workflows in the product development process. A persona is therefore comprised of several individuals, their tasks and workflows. By constructing a person who has to use the technology in question the development team members gets a mutual frame of reference representing the user's needs (ibid.).

In Barker's terminology personas addresses the behavioural unit of a behaviour setting and has an unequivocal focus on the individual. It combines a lot of individuals as well as behaviour settings, but does not address the milieu part of the behaviour setting in a systematic manner. The milieu is used as descriptive knowledge when relevant to the user's tasks.

The scenario method also addresses the user's tasks and is basically a story of the user and his activities. It provides the development team with a

description of a specific situation of use and includes brief descriptions of a goal, actions, setting and of course the user (Carroll, 2000).

As with the personas method a scenario only addresses the behavioural unit of the behaviour setting. It is comparable to a behaviour episode in the sense that it takes a snapshot of a single task in the user's workflow.

DISCUSSION

Usability testing has made it possible to test the user friendliness of the product at the end of the product development process. Presently the wish is to make an effort at an earlier stage preferably from the beginning of the development process. Also the growth in development of mobile technologies means that the existing methods face new demands. How to deal with this is, however, the problem.

Methods such as personas and scenarios addresses this problem by implementing knowledge of user behaviour in the product development process and thereby drawing attention to user needs, behaviour and workflows. Their strength lies in the fact that they communicate detailed accounts of real user behaviour and tasks.

From the behavioural setting point of view the personas and scenario methods have a one-sided focus on the user and lack a systematic approach to the context of use. Seen from Barker's point of view this means that they leave out the context that he considers as important as the behaviour itself.

Also in view of the demands of mobile technologies these methods provides no obvious approach, when a product has to deal with the user demands of several contexts. Behaviour setting theory on the other hand allows for description of different context via the behaviour setting concept. In addition to this the interaction between the person and the objects of a given context/setting is considered to be an important part of that description.

Scientifically speaking the personas and scenario methods are isolated islands. They are tools that collect and communicate knowledge of specific users, but they do not allow for generalisation and testing of the knowledge nor do they add to a scientific understanding of the factors that influence user behaviour. In this regard Barker's behaviour setting theory provides a researched framework of theory and methods that can be tested and developed upon.

The Necessity of Theory

On a more general level, in order to make significant progress in the development of tools to aid the product development process, it is necessary to widen the approach to the problem at hand and include relevant theory of real world behaviour.

Firstly, it is necessary to acknowledge that user behaviour scientifically equals human behaviour outside of the laboratory which is a notoriously difficult subject to approach.

Secondly, it is necessary to pay close attention to the fact that even though theories and investigations made in laboratory settings contribute with extensive and valuable knowledge, they can not be applied to a complex real world phenomenon without further ado.

Thirdly and finally it is necessary to recognise that user behaviour does not exist independently of human behaviour in general. On the contrary, it is a small part of a bigger picture, which means that when investigated it should be approached as such.

CONCLUSION

In conclusion it can be observed that using methods such as personas and scenarios is a step toward dealing with real world user behaviour on its own terms. In order to move forward, these methods should be recognised as providing a very limited understanding of behaviour. Given the rise of mobile technologies the influence of context of use cannot be underestimated. Also the field of HCI would benefit from a systematic and scientific theoretical approach to behaviour that allows for generalisation and development of knowledge and methodology.

Barker's theory of behaviour settings represents a possible new approach. It consists of both theory and methodology and is derived from extensive empirical work. It has not previously been applied within the field of HCI, but its theoretical core is centred on the relationship between human behaviour and the specific physical context including artefacts. This makes it a theory of real world human behaviour which at heart has human-object interaction.

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A NEW IFIP WORKING GROUP – HUMAN WORK INTERACTION DESIGN

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INTRODUCTION

During the summer of 2005 the proposal for a new IFIP working group 13.6 "Human Work Interaction Design" was approved. In this paper we present the objectives of this working group and give examples of the various research approaches present in the working group. Our objectives are to familiarize the Danish HCI community with the working group's existence and to raise a discussion about the interrelation between the field of Work Analysis and the field of Human Computer Interaction (HCI) and what may be gained from research and practice based on a Human Work Interaction Design perspective.[1]

MOTIVATION FOR THE WORKING GROUP

Established research communities have begun to focus explicitly on the relationship between extensive empirical work-domain studies and HCI design. These communities of researchers are distributed all over the world and they cover a great variety of disciplines and theoretical approaches in human sciences: psychology, anthropology, sociology, information and media sciences; and computer sciences and engineering. They have not yet, however, had their own forum under the auspices of an international association as IFIP, and given the new challenges for HCI design in relation to integrated technology for complex work and life, a new IFIP working group on HWID provides a unique opportunity to gather researchers working with these problems. In this forum the HCI research community

[1] The parts of this paper stem from the proposals that we the authors have written in conjunction with starting the working group and other parts are summaries of papers from participants in the recently held and first activity of the working group, namely an Interact 2005 workshop named: "*Describing Users in Context*" (see the reference list).

can draw attention to the new challenges entailed in design of technological support for modern, dynamic and complex work environments.

The target members of the working group are researchers and practitioners who are interested in all aspects of the on-going transformations of human work and cultures, and who are enthusiastic about the challenge of multimodal interfaces, augmented reality, ubiquitous computing, wearable technology, pervasive computing and mobile technologies.

The aims of the HWID working group are:

On an overall level the working group 13.6 HWID aims at establishing relationships between extensive empirical work-domain studies and HCI design. In view of this relationship, we want to encourage empirical studies and conceptualisations of the interaction among humans, their variegated social contexts and the technology they use both within and across these contexts. The group promotes the use of knowledge, concepts, methods and techniques that enables user studies and design experiments to procure a better apprehension of the complex interplay between individual, social and organisational contexts. By establishing a network of researchers, practitioners and domain/subject matter experts working within this field, a better understanding emerge of the relationship between work-domain based empirical studies and iterative design of prototypes and new technologies.

Scope

A Human-Work Interaction Design group (HWID) will provide the basis for an improved cross-disciplinary co-operation and mutual inspiration among researchers, but it will also lead to a number of new research initiatives and developments, as well as to an increased awareness of HWID in existing HCI educations. Complexity will be a key notion in the working group; it is not a priori defined or limited to any particular domains. A main target of the work group is the analysis of and the design for the variety of complex work and life contexts found in different business.

Technology is changing human life and work contexts in numerous ways:

- Interfaces between collaborating individuals in advanced ICT networks
- Small and large-scale distributed systems
- Multimedia and embedded technologies

- Mobile technologies and advanced "intelligent" robots

With this change toward new ways of working, an intensive demand has taken place for techniques and technologies that address contemporary issues connected to communication, collaboration, learning, problem solving and information seeking in large information spaces of great variability.

This change toward new ways of working and living must be embraced as a challenge to current knowledge and practice, presenting exciting new opportunities in the areas of knowledge acquisition, knowledge creation, management and knowledge sharing; As well as in the symbiosis of users and contexts of use, between work and life-quality and with both professional and individual development.

It is a challenge to design applications that support users of technology in complex and emergent organisational and work contexts, and thus opportunities exist to focus on methods, theories, tools, techniques and prototype design on an experimental basis.

Under these circumstances, the primary question is less whether we choose to study the use of a particular computer application or prefer, instead, to conduct bottom up empirical experiments of work contexts. The new problem is how we can understand, conceptualize and design for the complex and emergent contexts in which human life and work are now embroiled. This issue calls for cross disciplinary, empirical and theoretical approaches that focus on Human-Work Interaction Design, meaning that the technology itself and particularly the design and use of technologies mediates the interaction between humans and specific work contexts.

EXAMPLES OF APPROACHES IN THE WORKING GROUP

One of the challenges in HWID lies in the development of more context-sensitive representations of the human in information- and communication technological (ICT) perspective. Too reduced descriptions of humans limit the designer's conceptions of the user and eventually govern the development of the user interface. As such, user representations influence designers, researchers and teachers conceptions of what humans are, what computers, what humans' environments are, and thereby they also influence our imaginations of the future society as a whole. The first workshop organized by HWID was "Describing Users in Context" at the International Conference of Human Computer Interaction INTERACT, 2005, in Rome. The participants presented their work, which can be summarized into three

major topics: methods to study unpredictable and opportunistic tasks; richness and multi-dimensionality in the descriptions of users; and support of people's dialogue about their view of the world and their experience.

Methods to study unpredictable and opportunistic tasks

(Ham et al., 2005) present three case studies using three different methods, two for task-oriented design contexts (the Critical Decision Method and the Ethnography Method) and one for functional-oriented design contexts (the Cognitive Work Analysis Method in particular the Abstraction Hierarchy). They argue that the critical decision method and the ethnography method provide useful and effective descriptions, enabling task-based design requirements in contexts of anticipated situations, while the abstraction hierarchy provides useful and effective descriptions in work domains of revolutionary designs for unanticipated situations. However, they miss an integrated method for obtaining information about user contexts, a method that are both task- and function-oriented. The need for different positions is also a theme in (Kimani et al., 2005) who use activity theory, situated action and distributed cognition models to study the nature of tasks in real world, natural settings. Within the context of mobile computing, they focus on how supplementary tasks such as interacting with the device are performed while the user does another primary task. Unpredictable and opportunistic tasks can be studied with these beyond task-centric approaches in order to provide rich and complex descriptions of users in the mobile domain. Information Science is another domain, which requires discussion of current approaches to model and describe empirically the different kinds of contexts. (Pejtersen et al 2005) suggest that we need not only analysis of users' perceptual, cognitive, and social states, but also a deep understanding of how the users' contexts will influence their interaction with artifacts such as a Digital Library. They propose that the problems raised within the information science field can provide a number of useful issues for discussion of the current approaches to describing users in context within the HCI field.

Richness and multi-dimensionality in the descriptions of users

(Stanard & Wampler, 2005) focus on richness multi-dimensionality of the description itself. They discuss how design patterns so far has been close to traditional usability guidelines and thus there is a need to make design patterns better to support interaction of specific contexts. User Interface (UI) Patterns are presented as a way of defining, applying and evaluating the translation of cognitive and collaborative requirement into meaningful human computer interaction in the designed interface. The case is an airport

control system, and in general the discussion evolves around command and control systems. The patterns are useful for not only training and inspiration to solutions, but also reuse of patterns that have been quality assured in complex and risk environment, such as command and control systems. The authors argue for the need for hierarchies of patterns that are based on a specific application-domain or work-domain to enhance the users' work-performance. In the same vein, (Campos & Nunes, 2005) describe the richness in the human-work interaction by using a new method of work style modelling, which has been applied to the work-context of interaction designers (as well as to collaborative software design). The work style is described from a set of informally defined values, and the set of styles, which has been shown apparent in the work-context are then more formally depicted and evaluated using diagrams and metrics. By modelling users work style focus is put on work transitions (from one style of work to the other) and the designed solution ability to support the current context and changes in these – within the same application. The authors raise the question of whether it is possible to use work style modelling in other fields to describe flows between contexts of use. Recognizing the need for a general format for user descriptions, (Orngreen et al, 2005) present a theoretical focus on human beings as they are perceived by the designers of the technologies of the 21st century. They argue that today software developers use techniques and methods in software development that embed mono-cultural and mono-dimensional models in various contexts, which in the future must be replaced by rich portraits of human beings. (Orngreen et al 2005) suggest a research program that aims at developing a theoretical framework supporting the creation of rich multimedia portraits of the human user of multimodal technologies.

Support people's dialogue about their view of the world and their experience

(Nocera et al., 2005) suggest ways to support people's meeting and dialogue about their view of the world and their experience. They use grounded theory in the study of users' response to an implementation of an ERP system in various countries; the authors investigate negotiation – as reconfiguration – between the roles of users and producers. The analysis shows very different attitudes toward the same system, when implemented in cultural diverse settings, and that the making sense of the system in a particular work-context depends on cultural, organisational and individual preferences. These different attitudes and ways of use are particularly visible in breakdown situations, and the authors argue for interaction between users and producers (rather than user descriptions?), and that

producers should be able to observe and discuss users breakdown situations, their frustration and workarounds. (Bondarenko & Janssen, 2005) use a different methodological approach. They use the Affinity Diagram method adapted from Hackos and Redish in the requirements elicitation process for the design of personal document management systems. Without loosing the user's context and without requiring the reading of lengthy reports, this method helps structure large collections of mixed qualitative and quantitative data and gives dynamic requirements (as opposed to static user profiles or task flows). Currently, however, the method results in abstraction of the requirements into a general level and hence result in difficulties in mapping the acquired results into system design. Mapping analysis results to design in a multi-agent world is also a focus of the proposal by (Mc Morrow et al., 2005) who use cognitive task analysis to evaluate effective team performance in collaborative environments such as air traffic management in order to provide insights into how a technology becomes a 'team player'. A cognitive task analysis for effective team performance can help re-interpret the formal procedures often surrounding complex technological designs by negotiating among different perspectives and different meanings brought into the work environment

FURTHER ACTION

During the mentioned workshop and a Special Interest Group session at Interact 2005, the scope and possible future activities of 13.6 were discussed. Currently a HWID 2006 working conference is being arranged and the first call for paper is available at: http://dme.uma.pt/hwid06/. The focus of the conference is: synthesizing work analysis and design sketching, with a particular focus on how to read design sketches. For general information about the IFIP organization, the TC 13 on Human Computer Interaction and the 13.6 HWID working group, see http://www.ifip.org.

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CLASSIFICATION OF DESCRIPTIONS USED IN SOFTWARE AND INTERACTION DESIGN

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BACKGROUND

A large number of different types of descriptions – or genres – are used in interaction design and software development. Each genre is suited for capturing some aspects of an interaction design or software development, so designers who choose the wrong genre may inadvertently leave out essential information or spend time capturing unnecessary information because it appears to be required in the genre they are using.

I will therefore present a classification that makes it easier to get an overview of the most common genres and the purposes for which they may be used.

CLASSIFICATION PRINCIPLES

The most important aspect of a text is what is expressed within it. Therefore I have chosen to base the classification of genres on characteristics that determine what may be expressed within each genre and the types of expression that each genre invites the user to do. In order to make a reliable classification I have also chosen to use characteristics where it is possible to determine unambiguously whether they are present in a specific text. I identified four pairs of characteristics that fulfil both criteria:

Flexible versus structured: A structured text consists of a given set of elements – often sections – that in most cases shall occur in a certain order.

Static versus progressive: A progressive text describes events that occur at different times and in general in the order in which they occur. I use the term progressive and not the term narrative – or story – because a text may be progressive without being narrative in the literary sense of the word (as described by White 1981).

Generalized versus specific: A specific text describes something that appears to be a description of an event that happens at a specific time and

place, whereas a generalized text describes a concept based on a number of events with some similar aspects.

Open versus formal: In a formal genre, the wordings and grammar shall follow narrow and precise rules. I do not define a formal text as one that can be proved logically right or wrong; As Naur (1995) demonstrates it is perfectly possible to have proofs without formalization, and it may be impossible to prove a formal text right or wrong without some extraneous information about what is to be proved and how.

I found that the following widely used characteristics were unsuitable for classifying genres used in interaction design:

Fiction versus non-fiction: We are used to divide texts according to whether they describe real or imagined events. However, the same genre, for instance scenarios, may be used to describe fictitious and real events, which makes a classification into fiction and non-fiction less relevant.

Voice – the feeling a text conveys of the writer as a human being who believes what he or she writes - is often what gives the reader the strongest immediate impression (Elbow 1981). However, most technical texts have very little voice at all, and even when the voices of the texts are more varied, it is difficult to make a reliable classification based on them.

Purpose: Naur (2005) classifies texts according to whether they are intended to be descriptive or prescriptive, and we often consider the purpose of a text one of its most essential characteristics. However, if the purpose of a text is not stated explicitly, it may be difficult to determine. In some cases a text may even be regarded as prescriptive at the beginning of the development process and later be considered descriptive, when it is added to the documentation of the developed software.

Creative versus non-creative writing. According to Cheney (2001) creative writing uses dialogue, and descriptions of emotions, settings and places, whereas non-creative writing only describes the events that occur. However, HCS – Human-centered stories – is the only genre used in interaction design that may be regarded as creative, which makes a classification based on creative versus non-creative writing less relevant.

I identified fifteen different genres that are used during software development, and based my characterization of them on samples in my possession and on available literature, in particular a course book covering most of them (Strøm 2005).

		Flexible		Structured	
		Static	Progressive		Static
General	Open	Prototype	Scenario	Operation: Inst. guides User guides Use cases	Goals: Param. list Patterns Prototype Req. spec's Standards
	Formal			Design: Pseudocode	UML
Specific					
	Open	Persona	Situations: HCS Scenario	Use studies: Reports	Persona Reports

Figure 1: Karnaugh map showing the different genres and groups

The texts in most genres consist of a main or dominating element and an introduction and other explanatory information. I classified the fifteen different genres according to the characteristics of the main elements of them, assigned logical values to each pair of characteristics and constructed a Karnaugh map – a graphical overview often used to organize logical values – using the four pairs of characteristics.

RESULTS OF THE CLASSIFICATION

The Karnaugh map made it possible to divide all genres into five groups, where all genres in four of the five groups may share all four characteristics, and the two genres in the last group have three out of four characteristics in common. In addition, it appears that all genres in each group can be used for similar purposes - to describe one aspect of an interface or its use - during interaction design or software development. See figure 1.

Descriptions of the goal of a development process

Structured, descriptive, generalized and open:

Parameter list: Defines possible settings, input or output variables for the software to be developed.

Patterns: Describes possible specific needs and solutions that already have been designed to fulfill them.

Prototypes: Shows the interface or part of it (a prototype is not necessarily structured, it may also be flexible.)

Requirement spec's: Describes characteristics that shall be fulfilled by the developed software, but not necessarily how they shall be fulfilled.

Standards and guidelines: Are more generally defined characteristics that shall be fulfilled. They may be applicable to a range of projects or interfaces.

Patterns and prototypes require that the specific way a need is fulfilled is described, whereas requirements, standards and guidelines may describe only the need to be fulfilled.

Detailed descriptions of the operation of an interface

Structured, progressive, generalized and open:

Installation guide: Describes step-by-step the actions that are required to install the software on a specific system or computer.

User guides: Describes step-by-step the actions a user shall do to complete specific tasks.

Use cases: Describe step-by-step the actions done by the user, and the feedback the user receives from the interface or system.

Both installation guides and user guides are often written from a second person viewpoint (You shall ...) inviting the reader to step into them, whereas use cases simply lists the events in the order they occur.

Description of a workflow and situation of use

Flexible, progressive, specific and open:

HCS (Human-Centered Stories): These are driven by the emotions and motivations of the characters in them as they try to overcome conflicts or problems, and they may then try to use the interface as a tool to achieve their goals (Strom 2005).

Scenarios: These focus normally on showing how the interface is used in an actual situation of use (a scenario is not necessarily specific, it may also be general and describe a sort of ideal situation of use).

HCS are creative and focused on the users experience, whereas scenarios are descriptions that aims at showing how the different parts of an interface is used. Both genres may be used to describe real – non-fiction – situations of use or situations of use that may become possible with a new interface.

Description of results of user studies

Structured, descriptive, specific and open:

Personas: This is a composite portrait of the most difficult or demanding user of the system, and at least in principle based on observations of existing users (Cooper 1999). (A persona is not necessarily structured; it may sometimes be flexible and describe the user in a sort of free flowing prose.)

Reports of user studies: These capture what has been observed either during field studies or during laboratory tests. They are normally organized according to topics or problems, so all information relating to a specific problem or topic is placed in the same section. (However, there are a few examples of reports where the results are presented in a sort of free-flowing prose in a more or less haphazard order.)

Whereas personas are structured around the user, his or her background, motivations and tasks, reports of user studies normally focus on what is outside the user: observed tasks, problems and situations of use.

Description of a software design

Structured, generalized and formal:

Pseudocode: Describes the detailed function of a piece of software in something that resembles a high level programming language (Zobel 2004) (Pseudocode is progressive, and it may be flexible).

UML: Describes the detailed data structure of a system or a piece of software (Stevens & Pooley 2000): (In contrast to pseudocode it is static – it describes an unchanging state of the system or software).

Pseudocode is used to give a detailed description of a small piece of software, whereas UML is used to describe the overall structure of a piece of software.

DISCUSSION AND CONCLUSION

The different genres used in interaction design and software development were classified according to how the main parts of them were written. The result is a classification where the genres in each group not only share the

same characteristics, but also describe the same type of information, so all genres in one group may serve a similar purpose in a development project. The classification makes it possible first to choose a genre from a group that fits the given purpose, and then within the group to select the most suitable genre, taking into consideration precisely what it is possible to describe in it. However, the classification is only a first step. There is a need of more studies of the comparative advantages and disadvantages of the different genres and the best ways to combine them when doing interaction design or software development.

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OBSTACLES TO DESIGN IN VOLUNTEER BASED ORGANISATIONS

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INTRODUCTION

Although historically initially concerned with rather narrow interface issues, the HCI field has long ago extended its boundaries to also concern the importance of functions in IT artifacts. To design for functions and functionality means being concerned with the realization of goals, paired with users´ forming of new goals. To study this interaction from a strict individualistic perspective creates a one-sided and incomplete understanding - the social level must be included. In this paper we will discuss some social concepts which are related to the obstacles to the design of functions of ICT, with the empirical basis in problems encountered in action research projects.

The social dynamics of design and dissemination of interactive technologies are so complex that well-planned experimental design is not an option; in addition the issue of getting to access the object of interest (the processes of design and use) is so intricate that interested engagement, at least at the level of consultancy, is required. The inherent problem is that when we act as designers or are otherwise involved as process professionals, reporting that processes did not take shape as planned, hoped, etc is at the same time an acknowledgement of our own lack of professional control over the situation.

The dissemination and adoption of IT in general have been studied intensely in the IS domain, and the obstacles to the adoption of CSCW systems specifically have been dealt with, in particular with a business focus, by several authors (e.g. Grudin 1994).

In this paper we aim to learn from action research projects in the domain of volunteer based organisations; projects that in many respects could be considered to be failed design efforts.

TWO CASES OF DESIGN FOR VOLUNTEER BASED ORGANISATIONS

The two cases discussed in this paper share some important similarities. Firstly, they were practically both "one shot" projects, meaning that we did not have the possibility for a lot of iteration in design. Secondly, both cases did show a great deal of heterogeneity despite a seemingly shared ethos or object.

The Festival

The Festival Project (Bertelsen 1998) was a cooperation project, in the mid nineties, between a group of researchers and a volunteer based organisation producing an annual music festival, accommodating around 100.000 people over four days, with live acts at almost 10 different scenes. Researchers sought to validate a collection of development tools, whereas the Festival organisation was motivated by a need to find ways to utilize IT based systems in the production of the annual event. The project focussed on collaboration support for pre-production (i.e. the planning and preparation activities), and for the transfer of information from pre-production to the actual production in the week before and during the festival. Upon the initial investigations, mainly based on interviews, a number of design workshops, involving various action groups, were planned, aiming to clarify the suitability of various design solutions. Right after the first workshop, however, Festival management, for reasons that at the time seemed hard to understand, dictated a radical reduction of the scope of the project. Moreover, when the final report was sent to people who had contributed, Festival management claimed that to be a breach of mutual respect and in contradiction with the reality of the Festival – this seemed even harder to understand. In retrospect, it may be easier to understand management's resistance to the project. Firstly, the design activities threatened to become so interesting that the activists would spend too much time on them. Secondly, some of the proposed technical solutions would force political decisions, e.g. about access to information, to be made explicit. Thirdly, the participatory design based research activities, together with the suggestions of the final report, possibly created expectations about introduction of expensive technology throughout the organisation.

The Collaborative Writing Tool

With the aim of supporting a regional learning process, the researchers in participation with volunteering practitioners configured and implemented an

IT service for collaborative writing and documenting in a volunteering organisation with regional learning as one of its main aims. The vision was described as "200 citizens writing at least one article each, with assistance from each other". The project has also been described elsewhere at greater length (Zander, 2005, Wallin et al., 2004a, Wallin et al., 2004b). The project agreed that the aim was to increase the regional visibility inside the region as well as outside, spawn regional initiatives from good ideas originating from the writing process, and create the means of a sustainable process through the production of a concrete, physical book. In joint agreement with the CBO, our research group undertook an action research project, influenced by participatory design, which aimed to support the regional learning process in the micro-region with ICT support. After investigating the setup and focus of the project, a collaborative writing tool was configured to suit the needs of the micro-region. The collaborative writing tool is based on an ASP (Application Service Provider) service, had extensive functionality, requires no programming skills in order to customize, and most importantly, it had already a user base of 5000 people involved in regional learning efforts. The main design challenge was to accommodate for cooperation with peer review, commenting and joint authorship for a writing activity outside of the physical meetings. Negotiating the life-experience and reflection of living in the region means that different viewpoints and perspectives will be revealed, which calls for good communication and feedback on the written material and of other media content. A core group of volunteering users were given licenses, and the deployment strategy was to increase the number of licenses as the use took off, and to increase the scope of functionality as the competence in the user group developed. As the analysis will show, the expected use never took off – the tool was resisted.

COMMON ISSUES IN THE TWO CASES

IT systems enforcing structural discipline

As pointed out by Star (1989), heterogeneity is an important concept in understanding computer mediated work. In most situations relevant for design, individuals that are fundamentally different work together in groups on the same object, and they may act on and understand the object differently; but still the object maintains its identity across the various perspectives. According to Bertelsen (1998) this heterogeneity is increased to a fundamental heteropraxiality in the design of IT – users and designers

are fundamentally different and this difference is an important driving force in the process.

We argue that a similar heteropraxiality is generally present in relation to volunteer based organisations as such. As seen in the two cases pointed to in this paper, volunteer based organisations tend to be based on the engagement of people who may be gaining a lot of personal identity from the volunteer work, but who at the same time are at least equally much involved in other trajectories of life. This aspect of volunteer work means that the activity in question benefits from highly engaged people, who on the other hand could reorient their interest if something more interesting shows up. This potential problem was one of the main reasons why management in the Festival case chose to reduce the scope of the design project. In a similar, but less problematic, manner the reason why the collaborative writing project was a success (at least in terms of producing a book which is interesting to buy) but the collaborative writing support system was not, is due to the fact that the basis for motivation of most of the people writing for the book was located outside the regional learning effort although their actions contributed to it. This higher degree of heterogeneity and multiplicity in volunteer based organisations is a basic strength, even though it also accounts for the fragility of such organisations (as seen in relation to the Festival project).

IT based structures can embody rules to a very complete, but also completely inflexible way. Consequently, CSCW systems with their coordinating possibilities also enable making the setting stay in or converge towards monopraxiality. In the collaborative writing case, this was exactly what was needed for regional learning. However this need was not recognized in the beginning, due to the fact that heteropraxiality was not taken into account.

IT systems tend to objectify organisational structures in a way that may be in conflict with the nature of volunteer work. In general, design processes require explication of the rules, thereby working against openness and heterogeneity; potentially creating resistance against the design effort. Whether this conflict leads to some sort of organisational breakdown or to a more disciplined situation where all the volunteers work along the same ethos is an open question. In the Festival case the ability of IT to reduce discipline was a problem, for example groups could get much more autonomous in relation to management. And in addition the possibility that the design project per se was getting too interesting was equally problematic (a clear example on how ICT could burst the fragile structure of some volunteer based organisations).

CSCW systems can be designed for monopraxiality, for heteropraxiality, or for changing the activity system in the direction towards hetero- or monopraxiality. For instance, when the goal is to deliberately and rationally create a common community-sense when the borders of the community by necessity is a social negotiated construct, it requires some degree of monopraxiality. If a movement (regional development and creation of social capital) should grow stronger, it will be at the expense of other modes of praxis, because there is a limited amount of human labour. As described in Zander (2005), the design effort in the collaborative writing case focused on supporting a process where all users were partaking in collective activity directed to a common object, regional learning by book writing. It turned out that although several efforts were directed towards the completion of a book, but what characterized the organisation to a very high degree was heteropraxiality. The CSCW system for regional learning was thus never appropriated, because it was designed without taking the heteropraxiality of the collaborative writing project into account.

Designers Misconceive the Purpose of Design

Above we discussed problems arising from the difficulty of understanding the complexity of the relevant web of activities, in which design takes place. Another problem is that designers may fail to understand the intentions driving the design project; they misconceive the purpose of design.

An important lesson learned from the two projects is that designers risk misconceiving the task at hand in design for volunteer based organisations, despite participatory influences. In the Festival case the designers failed to see that the information some of the groups missed was missing because management had decided that it was too problematic to have information about arrivals to airports, hotels and the like flowing uncontrolled around in the organisation. Similarly, the designers understood computers as effective tools that could be introduced to improve quality of the work, whereas management basically understood computers as a reward for particularly hard working volunteers.

In the case of the collaborative writing group, developers thought that the purpose was to improve the outcome of the regional learning project, but in reality, there was no such shared purpose. Thus, the chairman was the only person in the CBO who understood the concept of regional learning. Adding to the problem is the discourse around learning and development. Who is publicly against that we learn and develop? The consensual mode of discourse may obscure the fact that users' commitment are rather shallow or that they are even resisting the concrete learning and development efforts.

Consequently, as the design activities were targeted to the regional learning effort, the resulting IT support for the book project failed to support the book project as understood by the contributors.

POSSIBLE CONCLUSIONS

In this paper we have discussed features that seem to be specific to volunteer based organisations, in particular we have pointed to a basic heteropraxiality that we have too take into account when designing for such contexts. It may, however, be argued that a similar heteropraxiality is becoming increasingly important in relation to design of work arrangements in the knowledge society. Thus we may need to do our analyses in terms of trajectories, ephemeral organisations, etc.

From an interface design perspective the two projects represent two extremes. In the festival project designers failed to understand and respect important organisational constrains as the deliberate background for missing information sharing. In the collaborative writing project, however, designers failed to realize that the collective activity of writing a high quality book was to be carried out by individuals who might not necessarily share the grand ethos of the project but still be equally engaged anyway.

We have showed that it is possible to report failed design project, although we admit that in both cases the researchers had to swallow their pride. More specifically we argue that the features of volunteer based organisations could not have been approached successfully without the insights generated.

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PROCESS MANAGEMENT TOOLS IN HIGHER EDUCATION E-LEARNING – A NEW HCI RESEARCH AREA

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INTRODUCTION

Online education is a growing trend world wide – eg. in-service training in large, especially trans- and multinational organizations (Turban et al. 2006); online and blended mode educations at universities (J. Drummond Bone 2004, OECD-report 2004); and educational programmes in developing countries (Daniel et al. 2005, D'Antoni 2005). Concurrently sharing of knowledge and online community building in general are acknowledged as important drivers in informal learning processes, while online learning in formalized educations tend towards an increasing adoption of collaborative learning as the pedagogic frame (Laurillard 2002, Salmon 2003). However, as one major driver in the general adoption of online education is economy, yet another trend is to raise the volume of learners passing through any education pr. time unit.

A NEW HCI RESEARCH FIELD

Put together, the current trends define a new framework mirroring the ongoing process of streamlining and commercializing higher education, where eg. the university teachers' ability to succeed bringing students through courses are measured from a business point of view of productivity – that is measured up against the interrelation of time, money and quality. One way to deal with these changes is to implement automated tests and intelligent tutors in Learning Management Systems (LMS). However, this model does not apply to collaborative learning and therefore an alternative way that applies to the collaborative leaning approach is to organize students in learning environments, where the teacher mediates student contributions in certain pre-defined areas in the LMS-structure.

However, a recent survey of the most widespread LMS and a case study of a Danish blended mode master programme both reveal, that tools supporting

teachers' process management of collaborative learning processes are not part of the offered toolboxes (Levinsen 2005a) and thus leave teachers with a heavy workload which may also affect the overall balance between time, economy and quality (Levinsen 2005b). Therefore the need for developing flexible process management tools in LMS is growing and it is the author's claim that HCI should enter this research area, as HCI methods may help to detect relevant tools and involve teachers in the design and implementation of these tools.

PEDAGOGIC PRACTICE AS PROBLEM SOLVING

Based on Acroff's theory of problem solving (Ackoff 1976), the most widespread pedagogies - instruction and constructivism – can be described though Acroff's concepts *reaction* and *proaction*. Due to the different practice, instructors *react* on the basis of testing students while constructivist teachers (collaborative pedagogy) *proact* on the basis of emerging tendencies during the group work, thus continuously constructing a basis for decision-making on how to coach their students. The reason is that while working together the students may construct misunderstandings of the subject matter as well as develop more or less suitable norms and attitudes towards communication and social behavior in the virtual learning environment.

The environment where teachers can observe empirical phenomena and detect emerging patterns and tendencies is the written discussion fora in the LMS. Collaborative online courses organize students in various online activities eg. role-play and discussions (Salmon 2003, Sorensen 2002). In these setups the students reflect on subject matter and literature. In order to *proact* under these conditions, the teachers need to observe the emerging tendencies and patterns, embedded in the body of contributions, eg. Changes in students approach to learning (surface vs. deep learning), communication patterns, patterns of collaboration within and among groups.

FINDINGS IN THE EMPIRICAL STUDY

A survey of Danish blended and online university educations demonstrated a wide range of combinations of subject matter and group sizes, as well as the LMS (eg. Blackboard, FirstClass, Sitescape, Virtual-U, LUVIT), do not emphasize any pedagogic strategies above others (Levinsen 2005a). However, a long-term case study of the Master in IKT and Learning programme (MIL), based on blended mode collaborative learning, revealed that even though MIL's LMS embrace a wide range of pedagogic

approaches, it does not offer tools that reduce the teachers' workload nor support *proactive* process management (ibid).

A survey based on Edutools (edutools.info 2004) which embraces most common LMS, shows the same picture (table 1). The *instructor/teacher-tools* support the design of learning environments and the actual carrying out of courses. *Student/instructor/teacher-tools* support communication, coordination and group management, while *administrative tools* support organisational management of students and courses. Nothing in the features of these LMS restrict the choice of any pedagogy, but the survey- and evaluation-tools are restricted to instructual pedagogy. Thus, most LMS offers a rich toolbox for constructing automated tests, eg. variations over the theme "teacher asks – student answers" and multiple-choice tests. Student-tracking tools produce reports on individual behavior in terms of: information on time and date, where, for how long, repetitions, failed or succeeded assignments, within selected areas of the LMS (instructual learning objects). Specified reports on students' effort to fulfill assessments and summaries of students' performance on assignments are also available.

Students/instructors/teachers tools	**Instructor /Teacher tools**	**Formal administration tools**
Communicative tools: Discussion Forums, Email, File Exchange, Chat, Video, shared Whiteboard	Course Delivery Tools: Testing and Scoring, Helpdesk, Course Management, Grading Tools, Student Tracking	Administrative tools: Authentication, Course Authorization, Registration Integration
Productive tools: Bookmarks, Searching, Review, Help, Calendar, Progress	Curriculum Design: Accessibility Compliance, Content Sharing/Reuse, Instructional Design Tools, Course Templates, Curriculum Management,	Technical Specifications
Student Involvement Tools: Group work, Self-assessment, Student Community Building, Student Portfolios		

Table 1. Learning Management Systems commonly shared features.

In collaborative learning, the precondition is that the learners work together and negotiate, eg. define mutual areas of interest within the subject matter, solve problems, investigate and reflect on the subject matter. LMS support

these activities through communication tools such as discussion and chat-fora. There are no strict measures in collaborative learning as the quality of the students participation in the ongoing process is part of the course evaluation of students' performance (Sorensen & Takle 2002).

With an average group size between 50 and course modules running for 2-4 weeks, the amount of written contributions is vast - 300-600 contributions corresponding to 60 to 160 normal pages (Levinsen 2005a). Nobody can manage to read this amount of contributions thoroughly nor can the contributions be embraced through scanning. Teachers can manage to follow and mediate discussions, but they can by no means detect evolving tendencies before they are very conspicuous – which obviously can be too late for dealing with the problems without investing a lot of resources. The consequence is that emerging tendencies and patterns become invisible from the teachers' point of view. The available survey- and evaluation-tools do not support qualitative evaluations of ongoing processes nor teachers' *proactive* decision-making. This is exactly where the LMS - as designed today - fail to support constructivist online pedagogy.

In the MIL case study the author manually produced a spreadsheet containing all participating students' individual contributions in all accessible discussion fora (the groups private areas were not part of the case study). This spreadsheet was used to analyze the body of contributions, thus allowing simulation of potential overview and filtering tools in future LMS. The simulations displayed several instances of divergence between teachers' impression of discussion fora and actual patterns. The simulations thus support the author's claim, that future LMS need to be enhanced with flexible and dynamic tools and views for process management.

In one example a teacher's written evaluation of a discussion forum revealed that the teacher believed interaction among groups to be more common than it actually was. Some groups never communicated at all and 5 out of 10 groups dominantly prefered to keep the communication within their own group (Orngreen & Levinsen 2005).

In another evaluation, a teacher expressed satisfaction that all students participated in a discussion, while the simulation displayed that 25% of the contributions were submitted during the last two days of the two-week course. Additionally, half of the group only joined the conference during the last 3 days, a fact that may explain why a lot of contributions never got any response at all. Thus, the simulation questions the teacher's impression that the students participated in a genuine discussion.

One means of evaluating participation is that each student should generate response on 2 out of 5 contributions (Sorensen & Takle, 2002). The simulation displayed that more than 50 % of the students balanced on the danger line in specific discussions. When looking into the overall pattern during the semester, it turned out that 20 % of the students were above the limit according to the definition, as more than 60% of their contributions were ignored – that is their contributions constituted the end of a discussion thread. Without tools that can filter contributions according to their location in the discussion threads, it is not possible to distinguish whether a student is drawing conclusions on a discussion or is genuinely ignored.

CONCLUSION

The teachers at MIL do their very best within the constraints of the current LMS. However, the simulation reveals that a vast amount of contributions combined with the absence of dynamic filtering and overview tools, may lead to misinterpretations that can affect the quality of the learning process.

LMS' complexity is comparable to Business Information Systems such as Enterprise Resource Planning Systems (ERP). The evolution of LMS can also be aligned with the evolution of Business IS such as ERP. According to Turban et al. (2006, chapt. 7), ERP systems moved from *first generation* (round 1990) combining tools for analysis and prognosis with transaction processes to *second generation* (round 1998) including business intelligence, communication and Internet. That is, an evolution from applications that support basic organizational transactions and streamline rational processes to supporting proactive decision-making. Current LMS constitute a mix of generations as they contain *first generation* transaction modules and rational analysis- and survey-tools together with *second generation* communication tools and Internet. Current LMS do not contain tools that can be compared with Business Intelligence tools allowing for process management and *proactive* decision-making. Without appropriate tools in the LMS, it is – as in business - not possible to detect the potential impact of emerging patterns. Consequently online educations are limited to *reactive* initiatives and *ad hoc strategies,* rather than exploiting analytical process management tools to provide a sound basis for the teachers' *proactive* decision-making.

Business IS can inspire future LMS tools, but there is a need for HCI to enter this area as users needs, specifications and tools are not identical. Tendencies that emerge slowly over a longer period of time are difficult to study as they are embedded in the body of contributions. Retrospective

analysis can identify the outcome of processes, thus pointing to areas of interest but cannot identify the actual processes, as practice must be studied through participation. However, the duration of courses combined with the unpredictability of which (if any) tendencies and patterns might emerge in a concrete context, complicate a participatory study of processes. That is, a long-term case study may be at risk not to produce any significant findings. Additionally, as time is *the* scarce resource in educations (Levinsen 2005a), it may be hard to persuade students and teachers to participate in time-consuming HCI activities. Therefore, we cannot apply current HCI methods and techniques uncritically and the major challenge that HCI face when entering this field is to develop and adapt suitable methods and techniques.

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FROM HANDICRAFT SCHOOL TO DESIGN UNIVERSITY

Eva Brandt

Danmarks Designskole

INTRODUCTION

Transforming a handicraft school with long traditions and ways of doing things into a research based institution for higher education is demanding. Danmarks Designskole is in the middle of that process, many activities are initiated, both employees and students are involved, and from outside representatives from various design professions. It is a design process with many stakeholders having various interests and opinions. It is not about designing a computer system, a service or product but about designing structure, content, work procedures, self images etc. which support educating designers of the future. As interaction designer conducting mainly action research the 'object' to be designed is different but the approaches are similar. This paper reports some of challenges in the ongoing process of designing a new school.

BACKGROUND: A DESIGN SCHOOL IN TRANSITION

What today has developed into Danmarks Designskole originated in 1875 as the School of Drawing for Women in the Danish Women's Society. In 1990 the school merged with the School of Industrial Design and the School of Interior Design and was named Danmarks Designskole [1]. The school has two institutes; The Institute for Product Design, and the Institute for Communication Design. Jointly they for the time being offer eight lines of specialization: Pottery and Glass Design, Fashion Design, Textile Design, Industrial Design, Furniture and Spatial Design, Visual Communication, Digital Design, and Production Design. In all 652 students from 20 countries are enrolled.

The school is under the Ministry of Cultural Affairs. A few years ago it was decided that Danmarks Designskole should strive to achieve status as higher educational institution (status as a university), which gives the right to educate bachelors and masters in design on the same level as for instance

the Danish Royal Academy of Architecture. Danmarks Designskole will be evaluated in this regard in 2010. From being a handicraft school with a three years educational program to develop a research-based curriculum for a five-year design program is challenging. The overall structure of the basic program is set and there are now students attending all three years of this program. The current focus is on developing both structure and content for the 2-years master program of specialization to follow the basis. The deadline for this is February 1st 2006.

DEVELOPING RECOMMENDATIONS FOR THE SCHOOL

A group of six employees have taken on the commission to plan and coordinate a thorough investigation, which will result in a report with recommendations for the board of the school and the principal. This investigation includes: (1) Focus groups involving representatives from the design professions. (2) Students from Danmarks Designskole. (3) Teachers and researchers from the school. (4) Benchmarking in relation to other educational institutions. (5)

Executive Order no 617 of 27 June 2003 on design education [2]. (6) Literature and reports on design. (7) The content of the existing lines of specialization at the school. And (8) the Occupation Report for 2004 [3]. The report summarizing the results of the investigations are to be finished December 1st 2005.

QUESTIONNAIRES FOR THE PRESENT STUDENTS

During the spring 2005 the present students were encouraged to fill out questionnaires. We got 155 answers in return. The majority of the questions were to be answered in free text. There were three main topics. The first investigated the student's background posing questions like: What was your occupation right before you became at student at Danmarks Designskole? Do you have a high school diploma (studentereksamen)? If yes, with what specialization? Do you have other educations? If, yes please specify. The next section concerned the education at Danmarks Designskole including questions like: Why did you want to study at Danmarks Designskole? What expectations did you have to the education? Does the education so far agree with your expectation? Why/why not? The last section about the future included questions like: What kind of job would you like to have after finishing your education? Why? What competences do you use in your future work? Are you working together with other people? What are their competences/educations? What is your role and responsibility?

Feed back from students

We are not finished analyzing all the data from the questionnaires. The following summarizes the main comments about if the students experience that their expectations to the school are fulfilled. The majority of the students are disappointed for various reasons. In general it is mentioned that the school lack structure and communication both between the administration and the students and between teachers and students. For instance it is difficult for the students to know what courses to attend when and where the teaching takes place, which is frustrating and de-motivating. Many assignments are judged to be too open and lack focus. Some mention it is too easy to pass exams, and they are surprised about that it is possible to pass a course by solving another assignment than the one given by the teacher. Some teachers are said to spent too little time with the students and seem not to be engaged in their work. Even some of them are not well prepared. The quality of the feed back from teachers varies depending on the person and engagement. The students suspect that the main reason for this is that the school lacks clear objectives about where it is heading, and disagreement among the employees about priorities etc. Many students spent very little time at the school even though they miss to be with fellow students and having contact with teachers. Several students suggest collaboration with other institutions and the industry.

FOCUS GROUPS WITH REPRESENTATIVES FROM DESIGN PROFESSIONS

Seven out of eight focus groups with representatives from the design professions have been carried out. Each focus group concerns one of the eight lines of specialization that Danmarks Designskole offers. It is a three hour meeting involving 4-6 persons from outside the school, 2-3 teachers from the line, the leader of the institute, 2-3 students to make notes and video record the session plus a facilitator leading the meeting. In advance the participants have received a short written introduction to the line of specialization and a series of profiles of graduates and what kind of jobs they are expected to prepare fore.

The focus group about Digital Design

The focus group on Digital Design included five people from outside the school representing various fields. One was a former student from the school who after several years and jobs now has his own one-man firm designing web-sites. He has won several prizes. Another was as art director in a computer game company for adults. The third design computer games

for children. The fourth makes interactive television, and the last was project leader in a project developing services for mobile technology for young people. Everyone agreed that it was important to choose and decide what kind of designers profiles within digital design to focus on. Right now the line seems to do everything with the possibility that the students would newer be good enough at anything. User centered design and being able to facilitate these processes were highlighted as essential. The candidates had to be able to collaborate and with this willing to give up ones own ideas if it would benefit the project as such. One stressed that the students had to understand that they as persons are not very interesting. The goal is to fulfill needs, to make clients happy because of excellent solutions. That demands the ability to investigate a need from the users point of view, the ability to understand various cultures, and market mechanisms. They should be good at generating ideas and fast in making prototypes. Simultaneously several also stressed the importance of making room for students with 'crazy' ideas, making room for students that cannot be put into boxes.

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THE USE PROJECT: BRIDGING THE GAP BETWEEN USABILITY EVALUATION AND SOFTWARE DEVELOPMENT

Als, B. [1], Frøkjær, E. [2], Hornbæk, K. [2], Høegh, R. [1], Jensen, J. [1], Nørgaard, M. [2], Skov, M. [2], Stage, J. [1] & Uldall-Espersen, T. [2]

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INTRODUCTION

We describe the USE project, a research project running from 2005 to 2008 between researchers from Aalborg University, Copenhagen University, and developers and managers from the software industry.

Despite at least 20 years of research into usability engineering, there is still a significant gap between usability evaluation and software design. Currently, an increasing number of development projects employ usability-engineering techniques in an attempt to improve the quality of the software produced. For example, the techniques most commonly taken up in industry are various forms of usability evaluation (Vredenburg et al. 2002). The cost-benefit arguments for including usability evaluation in software development activities are also strong (Bias & Mayhew 1994). While these evaluations often help identifying an exhaustive list of usability problems with the software, they typically have a very limited impact on the subsequent development activities. This lack of impact has severe consequences including unsuitable user interface designs, limited support for the core work activities of users, and lack of productivity gains despite heavy investments in information technology (Gould & Lewis 1985; Brooks 1987; Landauer 1995).

Current research fails to address *why* usability evaluation techniques do not impact practical software development. We see three main reasons for this. First, most research studies focus on generating reports that list usability problems with a certain piece of software. Recently, Wixon (2003) argued that feedback through lists of problems has limited relevance in practical software development, because 'it ignores that problems should be fixed, not just found'. Thus feedback from evaluations is not design-oriented. Second, only very few studies of usability evaluation are conducted in real

industrial settings. Among the studies listed in recent reviews (Gray & Salzman 1998; Hartson et al. 2001), none have been conducted in the context of software systems development. Thus, those studies fail to take into account the complexity of real software development. Third, research is only beginning to address how developers understand and assess usability problems (Dumas et al. 2004; Hornbæk & Frøkjær 2004). Therefore, we do not know in which form feedback should be provided to development projects, nor what kind of feedback to present for developers and managers.

The USE project aims at increasing the impact of usability evaluations on industrial software development, bridging the gap between usability evaluation and software design presented above. We do so by (a) exploring tools and techniques for extending feedback from usability evaluations beyond a mere listing of problems and (b) developing and evaluating our ideas for integration of usability evaluation and software design in industrial software development projects.

CURRENT WORK IN USE

To illustrate some current work in the USE, we below describe six subprojects that are either published (see references below) or under review.

Does usability work pay off? (Uldall-Espersen 2005)

The value of work to improve the usability of information systems in industrial settings is rarely accounted for. This subproject concerns an experiment where an administration and risk management system in a bank were improved through three versions during a period of six month. The system has ten users and usability data was collected through questionnaires and logging of data from practical use. The experiment shows how it was possible to improve the system over a broad range of measures covering efficiency, effectiveness and user satisfaction issues. The analysis of return on investment (ROI) of this usability work shows a pay back time of five years, but in this case, the most important improvements were found in issues not accounted for by the ROI. These issues, such as expected increased use of the system and a postponement of a replacement of the system, alone justified the usability work. This indicates how ROI analyses are at risk of missing the most important issues.

Are usability reports any good? (Nielsen et al. 2005)

A usability evaluation is a potentially rich basis for understanding and improving the design of the interaction between an interactive system and

its users. Realizing this potential requires a well-functioning interplay between interaction design and usability evaluation. This subproject explores how to provide feedback from a user-based usability evaluation to the designers of the user interaction. The subproject involved two experiments where the traditional usability report was compared to direct observation of the evaluation, and where the impact of the traditional usability report and its individual elements on the developers was assessed. The results indicate that usability reports have a strong impact, as they can significantly change developers' opinion about a system, especially about its weaknesses. Direct observation of user-based usability tests by a few developers has a similar strong impact, but is difficult to disseminate to other developers and does not facilitate systematic work with the identified usability problems.

How do usability evaluators conduct think aloud tests? (under review)

Think-aloud testing is a widely employed usability evaluation method, yet its use in practice is rarely studied. This subproject is based on a field study of 14 think-aloud sessions, the audio recordings of which were examined in detail. The study shows that analysis of observations made in a think-aloud session are done sporadically, if at all. When running a test, evaluators are already aware of problems that they seek to confirm. During testing, evaluators often ask users about their expectations and about hypothetical situations, rather than about experienced problems. In addition, evaluators only infrequently get input about the utility of the system being tested compared to input about its usability. The study show how practical realities rarely discussed in the literature on usability evaluation influence sessions, for example in the form of time pressure and evaluators not knowing the system they evaluate. The subproject raises a number of questions for usability researchers and professionals, including techniques for fast-paced analysis and tools for capturing observations during sessions.

How should we understand the evaluator effect? (under review)

The evaluator effect implies that usability evaluators in similar conditions identify substantially different sets of usability problems. Yet, little is known about the factors involved in the evaluator effect. This subproject consists of a study of 50 novice evaluators' usability tests and subsequent comparisons in teams and individually of the resulting usability problems. Also, 10 HCI researchers independently analyzed the problems. The study shows an agreement between evaluators of about 40%, indicating a substantial evaluator effect. Matching problems in teams improves this

agreement, and evaluators express greater satisfaction with the teams' matchings. The matching of individuals, teams, and independent researchers show an evaluator effect of similar size; yet they fundamentally disagree about which problems are similar. We argue that previous claims in the literature about the evaluator effect are questionable, and propose an alternative view of evaluator agreement.

How to test for children? (Als et al. 2005)

Constructive interaction provides natural thinking-aloud as test subjects collaborate to solve tasks. It has been suggested that children may more easily use constructive interaction rather than traditional think-aloud. However, the relationship between think-aloud and constructive interaction is still poorly understood. This subproject comprises an experiment that compared think-aloud and constructive interaction in usability testing. The experiment involved 60 children with three setups where children applied think-aloud and constructive interaction in acquainted and non-acquainted dyads. Our results showed that the pairing of children had major impact on the identification of usability problems as acquainted dyads identified more problems than both non-acquainted dyads and the think-aloud children. Furthermore, the pairing of children highly influenced the children's thinking-aloud as the acquainted dyads verbalized more than the think-aloud children. Finally, the acquainted pairs reported less frustration during the test despite the identification of more problems.

CONCLUSION

We have described the motivation for the USE project and some of the current work in the project. The key goals of the project are to deliver:

A catalogue of techniques and tools for usability evaluation and feedback with measures of impact on design that are empirically validated in industrial settings

Documentation of relations between usability evaluation and feedback in industrial projects

Integration of usability evaluation in software development in the participating companies

- Courses, training programs and a conference for practitioners to disseminate the practical experience to the broader software industry

The work exemplified above is the first step towards reaching those goals and better integrating usability evaluation and software development.

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BRIDGING BETWEEN IT AND THE ILLITERATE WORLD - RETHINKING HCI

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INTRODUCTION

The process of globalization leads to structural changes and is opening new windows for ICT initiatives. The digitalization of information- and communication processes is a development requiring, from the world citizens, literacy in use of computers. However, the majority of the world populations are illiterates. They are not only technical illiterates but also illiterates in the traditional sense, they cannot read and write. The ICT industry largely disregards the problem with illiteracy and the cultural differences, and it seems that a future area of growth for the Danish HCI research may be to strengthen the user oriented and interdisciplinary approach to design and development of ICT applications. This approach may be targeted to specific cultural groups and illiterates in developing countries as well as to the large groups of immigrants in the western world e.g. a multi-ethnic population in a Danish/ European context.

However, there is a need for research and development which bridges between the IT and the literate/illiterate world, at the same time bridging between IT development and HCI. A collaboration between Denmark and India offers such a unique possibility. India is an example of the global structural changes. India has developed an impressive ICT industry and has a very high level of expertise in software engineering. India's government has implemented e-government systems, which also address the rural populations. Denmark has an expertise in e-government, is strong in interdisciplinary approaches to development and design of ICT applications and has a long tradition for cooperation between IT developers, researchers and users. Denmark also has a tradition for a human centred design, and usability is seen as a competitive factor. In India usability is on the agenda in only few IT companies, and it is also new to the academic world (Pradeep

Y. 2004).[1] Yet the Indian population is very large and the potential users are highly diverse groups of which many are illiterate[2].

A CULTURAL PERSPECTIVE ON HCI

In a collaboration between India and Denmark the challenge and the advantage lie in the cultural diversity. India has experience with design for different cultures, has implemented e-applications and identified problems with design for diverse groups of users who are both IT-illiterates and traditional illiterates. Bringing this knowledge and experiences into play with the Danish tradition for interdisciplinary approaches to user-oriented design create a unique setting. With such a collaboration we may:

- with India as "laboratory" investigate the cultural bias in our Danish approach, e.g. the bias in our HCI methods and tools
- together with researchers from India develop tools which will be better fit to cultural contexts and conditions
- through cooperation with India learn about cultural context for ethnic groups in relation to central authorities
- focus on e-government because there is a parallel problem space of "cultural distance" between central authorities and many ethnic groups also in the Western world/Europe as a consequence of the large immigration
- through our collaboration with Indian researcher on "cultural other" acquire knowledge contributing to the development of e-government applications in Denmark/EU which will reach ethnic groups
- offer IT businesses new methods and techniques which will be valuable in their development of applications for their markets in Denmark and globally
- achieve a collaboration with researchers and businesses in EU who develop methods and techniques of relevance to ethnic groups

[1] The first Indian conference on Human Computer Interaction was held in December 2004

[2] During the 2005 Indian HCI conference the hosts estimated between 400-500 million illiterates in India

IT APPLICATIONS FOR ILLITERATE USERS

E-government in India is a broad concept covering financial governance, democracy and service to the inhabitants: health, education, agriculture etc. However, experiments have shown there is a gulf between the intended use of a technology and the actual use because "neither Development nor Quality Assurance Process consider Usability." (Jani R. and Badave V., 2004, (Singh and Agrawal 2004).

One solution explored by the Indian Government has been to set up electronic kiosks in remote areas and let 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 which may consist of 40-50 villages. A block administrator may be miles away – geographically, and mentally – from the individual farmer from a remote village who wants to ask experts in Delhi about the black spots on his crop. The expert in Delhi may never have visited the remote area of the remote state in question. "In India language, context, culture change in every few kilometres" (Panvar et al, 2004), and the villagers may have no concept, nor understanding of computers and network – the technology making no sense to them. Hence the individual "user" becomes dependent upon the operator, and questions and answers may suffer from the administrators' handling. Besides, information is power and the administrator as gatekeeper of technology and interpreter and handler of information may undermine the intended technological enhancement of democracy because gate keeping may develop into a very powerful (and misused) position.

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

Figure 1 This web page may be activated through mouse over. In this case user moves cursor over the tractor in upper left corner, and a text pops up.

Figur 2: User moves the cursor over the tree and several objects become visible: people, the health station, text in a bubble and a red arrow pointing to a menu bar. The user is requested to key user id, password and entry (location): district, block, gp or village and finally user may select to see rainfall for given period

In order to minimize or reduce the negative effects of gatekeeping it has been suggested that e-government services become personalized, and experiments have been carried out with touch screen kiosks. But "establishing identity of person and verification" is problematic.(Katre 2004). In one experiment illiterate users were asked to choose a combination of images, 7 images for username and another 7 images for user identity. There was no problem in getting users to choose among different visual images of which there was great variety in style and size. However, a few days later the users did not remember all the visual images they had chosen nor the sequence in which they were chosen (Katre 2004).

CULTURE AND COGNITION

There is a digital divide between 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; " interactive speech interfaces (Girija, P.N., 2004) and special navigational assistance

such as "signboard system, vocal agents or natural language processing dialogue" (Panwar V. and Pradeep Y., 2004).

However, a main problem seems to be the relation between the culture of Information and Communication Technologies and the cognition of everyday life (Bruner 1990). The villagers had no problems reflecting on rain, clouds, grey skies, sun framed within the concrete experiences of everyday life, But when these objects were transformed to a computer screen, they did not seem meaningful, and the villagers were not able to reflect on them when interviewed.3 They were concepts, 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 nor their perception and understanding of the ICT applications they are introduced to.

Context is embedded in cultures and differences in cultural contexts constitute differences in cognition (Barry and Dasen,1974). Research has shown 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). The cultural context of cognition raises a number of questions in relation to the global IT development. How do we design and develop IT applications that embed an understanding of the cultural context? How do we design and develop to an illiterate population and how do we test and evaluate the illiterate user's interaction with the computer? These questions are significant because illiteracy is a global problem. The threat of IT, to divide the world into those who have access and those who do not, makes these questions highly relevant.

HUMAN CENTRED IT DESIGN – A FRAMEWORK

Denmark has a long tradition for a human centred approach to design of e-applications and usability is a key issue. The Danish and Scandinavian research tradition is to involve users in development of IT systems (Ehn 1993, Bødker 2000)(Nielsen et al 2003). A development which goes hand-in-hand with the unfolding of a methodological theoretical framework. One approach here is the understanding that the human being (the user) is a constitutive factor in the interaction, and therefore in the design of the interaction, and in the techniques and tools developed to investigate, analyse and test. It is a user perspective that draws on the understanding that computers interact directly with our cognitive processes and influences how

[3] Personal communication, Dinesh Katre, CDAC

we perceive, think and feel. But the mental interaction is not isolated from context, hence studies of human-computer interactions is also studies of context, and methods and techniques must embed the interaction and the context in which it takes place.

The questions of cultural embeddings are significant in relation to HCI, because cultural context is also embedded in the methodological framework we work within and in the techniques and tools we apply. The traditional HCI methods and techniques have developed along with the IT industry and are based in western thinking. They build on the assumption that users:

- have an abstract conceptual understanding of computes and digital network
- have no conceptual problems with understanding the writing on the screen
- nor that the text is also visible on another VDU thousand of kilometres away
- masters the keyboard
- can write and read
- can engage in meta reflections on the interaction

But what if the user population is technically illiterate? What if they are functional illiterates, that is they cannot read and write? There is a cultural bias embedded in the traditional HCI methods and techniques (Smith A. & Yetim F., 2004). We need to bridge the gulf between IT, culture and illiteracy and rethink the methodological basis. We need to develop culture sensitive user oriented methods by focusing on methods and techniques for design and development of culturally sensitive ICT applications for illiterates and for people from different cultures. We need to focus on design of user driven interfaces and software applications which can be used by illiterates, and by people from different cultures.

EMPIRICAL AND EXPERIMENTAL

Such an endeavour needs to be empirically driven and this raises the question: how may we work from a user perspective. From an IT and engineering perspective it is not possible to speak meaningfully of a technology push. Because there is no practice to study. New ideas, innovation and suggestions to new artefacts must be looked for elsewhere. A radical shift from a technology push to people push seems necessary and point of departure may be taken in the everyday life of human beings who live in culture specific contexts and act in time and space.

The complexity of the India scenario gives this unique possibility of people push and offers and necessitates highly creative approaches to development from a user perspective. This implies that a collaboration needs to be framed by a grounded theory approach where praxis and theory mutually inform and condition each other (Strauss and Corbin 1996). The approach may help reveal cultural biases and may open for new design and developments of new HCI methods and techniques as well as new applications. But the design and development needs to be based on experimental prototyping just as techniques and tools for test and evaluation of the human interaction with the computer/other ICT artefact has to be developed on an experimental basis. It is by confronting existing techniques and tools with explorative and experimental approaches that innovation may come into play.

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