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Proceedings of the Eighth Danish Human-Computer Interaction Research Symposium

20th November 2008

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Keynote Speaker: Marianne Stokholm

Biography: Marianne Stokholm is Industrial Designer MDD and professor in industrial design at Aalborg University, Denmark. She has a background of 20 years in design practice within her own design consultancy, working for Danish and international companies. Many of her design are awarded and on display in design museums all over the world. 10 years ago she was invited to set up a new inter-disciplinary design education at Aalborg University, which is highly appreciated by Danish industry. She is also the Danish initiator and founder of research in the theory, process and methods of integrated design based on a holistic approach to design.

Title of Keynote: "Design –transformation through interactions"

Abstract: Design is most often perceived as a matter of giving form to physical products and good design a question of appearance and utility. In a broader perspective however design is understood as a systemic process for transformation through interaction.
This keynote will draw on my personal experience from design practice and recent research concerning the integrated design process. The keynote will present a holistic and integrated approach to design and provide examples of interaction based design solutions as well as a framework to support transformation through design and navigation of interactive design thinking

Aalborg University, 20th November 2008

The give and take in participation

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ABSTRACT

According to Vygotsky's theory of learning, external speech is the process of turning thought into words, allowing exchange and negotiation of viewpoints, which may in turn lead to development of new ideas. Hence, despite the unspeakable nature of much of skilled practice, articulation and listening is necessary, shall participatory design fulfill its purpose of designers and users transcending the present in a joint effort. To enable users contribute own ideas, they need to develop design skills to the level where they can verbalize, what they are doing, design-wise, while designers, in order to sufficiently understand users' practice must be able to explain it. The paper illustrates this point with empirical examples of failure and success in mutual listening and articulation.

Keywords

Participatory innovation, designers, users, motivation

"All knowing of reality involves the personal commitment of the knower as a whole person" (M. Polanyi in 'Personal Knowledge', p. 39)

INTRODUCTION

Participatory design, user-driven innovation, participatory innovation, these are labels for design activities employed by designers in need of information and ideas, which can not be captured through traditional market research or observation studies. User participation was seen as a logical necessity within the Scandinavian tradition of *participatory design* in software development, as initiated by Kristen Nygaard in the 1970ies; partly in order to include context in the design brief, and partly as a political duty to influence the use of IT in a democratic direction, or at least avoid damaging skills and knowledge of future users. Within manufacturing, von Hippel, also since the 1970ies, has advocated *user-driven innovation* in the form of lead user participation as the way of renewing business strategy, and re-orient the production process, partly because crucial information sticks to the context in tacit ways, partly because of getting access to the innovative power of these lead-users.

Whereas in software development the paradigm of interaction between designers and users was democratic, with the designer taking the lead, the paradigm of von Hippel is putting the user in the drivers' seat, regarding design decisions [13]. So instead of manufacturers doing costly and time-consuming market research, von Hippel suggested to supply lead user-innovations with customer toolkits and drive innovation from there. The concept of *participatory innovation* as defined by Buur [3], seeks a middle ground in combining participatory design and design anthropology with a market orientation, thereby bringing skills and practices in play, by means of a toolbox of quite elaborate collaboration techniques linking field study, sense-making, co-ideation, business-modeling and co-design together [3, p.268-69].

But how much do the users need to know about design practice in order to be able to participate on equal footing? Whereas participatory designers are deeply interested in the tacit elements of the practice of future users, the tacit aspects of design practice is seldom spoken of. What does it take, then, for designers to sufficiently articulate design practice? How to make users develop design skills to the extent that they know, what they are doing when participating in the design process, and are not taken hostage of the professional designers plan, but can influence it? What does it take for users to estrange themselves sufficiently from the context to be able to now only repair and restore, but also alter and expand?

My suggestion is to situate users' design education in the designer-user-collaboration, and I arrive at this solution by reflecting upon examples of unsuccessful and successful practice of informing users about design practice, seen in the light of Vygotsky's learning theory and Kierkegaard' philosophy of teaching.

AN EXAMPLE OF UNINFORMED COLLABORATION

The designer-user relationship has been much debated within the discipline of Human Computer Interaction, at several conceptual levels. Designers within the human factors approach have been criticized for compromising users by reducing them to mere components of a system [2], while designers engaging in participatory design have been accused of putting themselves in a heroic position thereby turning users into victims to be rescued [11]. Researchers from Science and Technology Studies have dissolved such contradictions by suggesting objects and humans alike to be actants [9], while activity theorists see

both designers as users as intentional agents, each with separate motives. [6].

Although these academic and analytical conceptualizations of 'the human' are part of many practitioners' formal education, practice, when involving users in design-collaboration, are so full of logistics and other ad hoc considerations, that designers hardly get to anticipate and articulate users' potential outcome, including unintended complications, despite that they, based on experience, know a good deal about possibilities and risks.

This came to my mind recently, when I was responsible for an instance of user involvement. I had a pilot project in collaboration with a manufacturer, who wanted to know about elderly peoples' preferences with respect to sitting. My idea was to try out small, easy-to-use audio-recorders as a self-reporting device concerning habits and preferences in intimate situations, where the designer could/should not be present. When in the actual situation, users should push a button and say how they felt about sitting, and eventually what they would like to change. If the pilot study went well, a more elaborate study would unfold.

Extreme time pressure caused me to grab an opportunity on the fly: A group of students had done a project with a group of elderly people, and on my request they agreed to contact 'their' elderly, visit after a week and collect the audio-recorders after yet another week. The students managed to get two recorders out, but nothing was recorded, except for when the students visited and conducted sort of an interview. I handed out one myself, to a good friend in her 80ies.

The push button on the recorder was not easy to hit correctly, and without an initial building up of interest and trust through joint activities - which I skipped because of the time pressure – these users were left with 15 minutes of introduction and a manual. Situated self-reporting did not take of. My old friend came back to me shortly after having received the recorder and said: 'Now I have said what I have to say, so you may just as well have it back. And no thank you, I do not want a box of chocolate in return, I like to think I do something for research.' On the disk was a neat and elaborate piece of information about how she wanted to sit, which I guess she had written in hand, and then read aloud to the recorder.

The project ended well in the sense that we managed to create a card game out of the material we eventually got, which the manufacturer found stimulating for getting a sense of what elderly people think about 'sitting'. I, however, was left with a sense of bad consciousness. The elderly people wanted to help researchers, and all I gave in return was trouble operating an audio recorder.

This incident motivated me to find a take on the designer-user-relationship, which allow me, when involving users in participatory design and innovation, to reflect-before-action in order to avoid ending up in the same corner again. How do I engage with users in a way why allows them to develop a knowing why they do, what they do, design wise.

TWO EXAMPLES OF INFORMED COLLABORATION

Krysto Wodizcko, professor at MIT, accounts for a successful user-designer collaboration as part of his design of a vehicle for homeless people [15]. The project was part of a series, which Wodiczko calls 'critical vehicles', about which he says: *'My work attempts to heal the numbness that threatens the health of democratic process by pinching and disrupting it, waking it up, and inserting the voice, experience, and presence of those others who have been silenced, alienated, and marginalized'* [15, p. xiii]. Although Wodiczko did not aim at solving the transportation and sleeping problem of homeless people, solving this problem was his way into understanding, how the city treats the homeless. The design process Wodizcko undertook together with homeless people of Manhattan in New York, was his wayfaring towards understanding.

In the dialogue Wodiczko accounts for in his book, the users are at first polite and appreciative listeners, while Wodiczko demonstrates the prototype vehicle, and how he has listened to the suggestions of the homeless, when they last met, how he has improved wheels and balance and more. Oscar, one of the homeless, still appreciative, says it is good that it is easy to operate – not because of the light weight in itself, as Wodiczko suggests, but because of 'police, traffic, people in general'. At first Wodiczko does not really hear this remark, and continues his talk about size and foldings. But Oscar sticks to his line of thought concerning how many cans the vehicle can hold. Only when Oscar mentions the amount of 500 cans Wodiczko gets so surprised that he starts listening more carefully, and realizes that the need Oscar is expressing is not about sleeping, but about transportation of cans. They start going back and forth between these two design briefs for a while, respectfully acknowledging each other's ideas, and in the end another homeless, Daniel, says to Wodiczko: *'See, I gave you a lot of good ideas'*. [15, p. 94]. I take this as an expression of a happy feeling of having been able to give.

I came over a similar example myself, when doing a study of technical support people. One of the supporters created video in collaboration with researchers, much the same way a designer in a participatory design project engage in prototyping. This technical supporter described to me how he would experience interacting with his clients: '- *What I do if their ideas seem kind of odd? ... Well, then I try to explain to them why that won't work, you know, and*

I'll say: "That's is a great idea, but you know, this probably would work better, you know. Try it this way", because they'll come up with these ideas and these ways they want to do things and some times it is not feasible, you know, for one thing, or if it is possible, it is going to cost a lot of money to reproduce it and that sort of thing ... - And then it is funny, because then after we do the video tape, they'll take it and they'll look at it for a few times and they'll look at it with other people and then they'll come back and say: Y*ou know what: maybe we can improve on it with this, and then I'll go: Yeah, that is true, we can cut that out and we can add this and do this in stead of that, so they are learning as well. ... I have given them sort of a guideline, in the sense that - actually mostly it is by repetition - if there has been one particular group that has done more than one video, then after the second time then they kind of get a sense of what I and the machine can do, what they want, and then if there is something else that they think about that they might want, then they'll say, well you know, can we do it this way, and more often than not we can do it that way and then we just improve on it in that way. So they are learning as well and they are learning to step outside of that boundary, that guideline sort of thing. .... [Then] it becomes more fun, because they are more knowledgeable and then they, we kind of feed each other, and then they' ll come up with an idea and then I go: "oh yeah, that will be neat", and then "- plus we can do this on top of it", and so it's a nice interaction there"* [4]. I interpret this expression as an example of mutual gratitude for being able to give.

ARTICULATING AND LISTENING TO DESIGN PRACTICE

As pointed out by Alexander [1] the basic way of designing is intuitive. In intuitive design, design is a response to change in environment and resources, an attempt to maintain the quality of the tradition by taking away faulty traits within the given frame. In this endeavor we are all designers, although some are more apt than others, some of which would be called ‘lead users’ in von Hippel’s terms, and become drivers of innovation, by their own initiative. In conscious design: the professional, large, planned effort to transcend the given, with its division of labor, outside resources, and thinking out of the box, the designer has management obligations, which more or less define the designer-user-relationship as a professional partnership regulated by contract. Here the use-designer relationship has a predefined, formal character. The designers’ professional competence consists in a repertoire of knowledge of ways to relate forms and materials, and manage the complicated process of making the choices that makes the chosen form fit the context of use.

Participatory design and innovation activities are employed, on the designers’ initiative, when designers lack knowledge about the web of relationships between user and product such as interaction with environment (people, places, the things they do, the way they do them), skills and practices (rule following, inclusive/exclusive boundaries), and motivation (values and attitudes) – or when, as in case of participatory innovation, designers want users to become innovators.

For users to develop their design skills to the extent that they know, what they are doing, the designer must plan to not only serve a meal of entertaining activities for the users, but to invite the user into the kitchen and into the cooking, this way invoking the user’s curiosity discuss. Users’ engagement in design is momentary and voluntary, but under the right circumstances it has a interpersonal commitment to it, the ethical demand [10] described by philosophers through the ages, which designers, who rely on second hand user information, may keep at a distance: the sense of concern for a fellow human being. They may not have the same destination, nor may they share background, but they have to share their moment on the road on equal terms. This is the essence of true peer-learning.

VYGOTSKY’S THEORY OF LEARNING AND DEVELOPMENT

According to Vygotsky [14] learning turns into development of new capabilities as the result of mutual engagement between a learner and a more capable peer. Vygotsky’s theory of cognitive development suggests that learning leads to development through interaction between more and less capable peers, where the former has the chance to teach, and the latter to receive guidance in experimentation. This theory supports the idea that in general exercising a give and take pattern in interaction motivates learning and development. Vygotsky emphasizes the reciprocity of the relationship arguing that the more capable peer by supporting and helping the learner get an opportunity to externalize and verbalize and explain what he himself holds as tacit knowledge. It is at this explanatory stage, according to Vygotsky, that the development happens, for the more capable peer, notably, who, however, also in his explanation creates a scaffold and a safe zone around the learner’s exploration. Hence, when the homeless teach Wodizcko about can-collection, they develop *their* professional competence, whereas he develops he design competence, when explaining to them his considerations regarding materials and forms – provided the other party listens. Once their relationship reach a certain level of trust, they begin to realize each others reasons and explanations, and users can start explaining how they would like the design process to unfold.

The philosopher Søren Kierkegaard describes the reciprocity in the teacher-learner relationship: '*To be a teacher is not to say: this is the way it is, nor is it to assign lessons and the like. No, to be a teacher is truly to be the learner. Instruction begins with this, that you, the teacher, learn from the learner, place yourself in what he has understood and how he has understood it, if you yourself have not understood it previously, or that you, if you have understood it, then let him examine you, as it were so that he can be sure that you know your lesson. This is the introduction; then the beginning can be made in another sense*'. [8]

Trying to put oneself in another person's shoes is a gift, which constitute mutual gratitude, and lay the ground for the 'beginning in another sense', which is the transcendence aimed for in participatory design.

Ehn [5] describes how they, in the UTOPIA project, at the beginning, communicated via the description tools of computer science: '*We started out by using traditional, more ore less formalized description methods ranging from scenarios to data flows. However, these were too abstract and did not function very well as a vehicle for communication with the graphic workers. The situation was drastically improved when we built a mock up to simulate computer based page make up'* [5, p. 335]. The dramatic improvement may in fact mark a shift in the graphic worker's position from being learner to becoming a teacher, having to explain why. The graphic workers changed from experiencing themselves as pupils trying to learn a new language through which they could participate in the designers' practice, to experiencing themselves as teachers of their own practice. This way both parties saw each other as professionals, although of a different kind, something, which fertilized the ground for the subsequent collaboration.

CONCLUSION

Participation in design and innovation requires freedom to re-formulate the design problem, to engage in a form of interaction, which allows asymmetrical competencies to interact by trying out each others role as learner and more capable peer respectively, thereby getting ready for that beginning in another sense, which makes it possible to make use of prototyping and arrive at joint reformulation of the design brief. Examples of designer-user interaction in participatory innovation show how motivation seems to spring from the initial exchange between designer and user. The development happens the moment users are able to explain why they work with design the way they do, and designers are able to explain why users work with their profession the way they do. To find out more about this, participatory design projects must address the issue and make it a research topic. Most importantly, however, the design education should include training in listening, something which participatory practices tend to overlook at the expense of representation and expression. Here lies a whole field to be further explored in participatory design and innovation research.

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Tool – Material, Metaphor – Metonymy, Instrument(ness)

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ABSTRACT

This paper, presents in an abbreviated form the argument presented in an earlier paper [1], and tries to relate it to the theme, “retro in the interface”.

We introduce the concept instrumentness as a quality of human-computer interfaces. Instrumentness points to the way musical instruments are controlled and conceptualized through values such as virtuosity and playability, which are important for computer-mediated creative work supporting development in use beyond what is initially designed for. The paper performs a conceptual investigation into qualities in software interfaces that support creativity, supported by analysis of, and interviews with, musical composers. Instrumentness is explained through discussions of materiality and metonymy as central strategies for computer mediated creativity. The paper is contributing to an investigation of the aesthetics of use in relation to software, pointing to alternative values, differing from traditional usability, which are also relevant in creative work outside art and music composition.

INTRODUCTION

Some concepts stay around in HCI so long that they in a continuous development go from cutting edge over slightly dated to passé and then possibly re-actualized. One such concept is the tool metaphor. The tool metaphor came about in attempt to install the user as an active part in the use situation. This paper, presents in an abbreviated form the argument presented in an earlier paper [1], and tries to relate it to the theme, “retro in the interface”.

We look into the instrumentness of interactive software mediating a variety of human actions. In particular we look into aspects of instruments that stimulate the users to develop within and transcend established use, and more specifically we are interested in instruments for creative action. We aim for perspectives that can back up design of interfaces that support for creative action and development in use

Our enquiry highlights the specific instrumentness and materiality of electronic music instruments, as well as the complexity of mediation involved. Furthermore, composers’ systematic violation of the metaphors in the software leads us to propose metonymy as a vehicle for users’ appropriation of software. Finally, we revisit the concepts transparency and reflectivity.

We interviewed two experienced, but still experimenting composers, who we have chosen to present with names and artistic, musical identities, since their artistic identity, poetics and use of software are closely connected. Our goal has been to learn about and reflect theoretically on how they use software to carry out their creative work. The interviews were open-ended qualitative interviews of about one and a half hour’s duration each. The interviews were situated, i.e. conducted, in the composers' daily working environment. The interviews were recorded on video and subsequently analyzed.

INSTRUMENTNESS

In much HCI, the mediatedness of computer supported activity has been somewhat hidden under the transparency ideal – the instrumentness has been set in parenthesis. Thus, there is a strong contrast to the field of music where the instrument seems to be in constant focus.

The obvious dissimilarity between a word processor and a violin, and the fact that it is considered necessary that it takes many years to master the violin whereas the word processor should be mastered within weeks, have lead to the idea that the way human-computer interfaces mediate human action should be fundamentally different from music instruments’ mediation. This is related to the way the idea of transparency is often perceived as a passé concept in much contemporary literature [e.g. 2].

In order to understand the composers’ interest in the software we need to look at the software as a musical instrument. Consider the violin. The violin is not just a tool for playing "violin music" and as such the instrument by which you control the sound. The violin is the sound itself since the physical construction of the violin: the wood, the lacquer, the material of the strings and the bow etc. are responsible for the nature and the quality of the sound. Also the form and the finish contribute to the feel of the instrument and thereby the player's ability to perform with the instrument. Thus, professional musicians have a strong feel for their instrument exactly because they recognize that the instrument is part of the music and not just their access to it. Even though the violin is not the only focus of attention of the violinist, who has of course also the orchestra and music in focus, it would not make sense to overlook the violin as both an interaction instrument and a domain object to the benefit of the music.

In our study, this is directly related to creative software. Of course software is not an instrument in the same sense as a violin, but several instrument characteristics are traceable in the composers' use and understanding of software. First of all the software is playable. The sound generating processes run in real time and the sound can be manipulated instantaneously by moving a slider or turning a knob in the GUI interface or by typing in numbers or altering codes. Secondly, the software (filters, oscillators, reverbs etc.) has a unique sound profile due to the nature of the sound algorithms and as such they are, according to one of the composers, comparable to different instruments. Also the understanding of the software as an instrument can be seen in the way they accept they have to discipline themselves in the use of the software in order to benefit from its complexity, but most important also to extend or perhaps even transcend its limitations. Like a violin, such software is not easily mastered, but with enough work it provides a possibility for achieving virtuosity. It is worth noting, however, that this should not lead to the idea that design for mastery can be obtained by making the artefact clumsy or inaccessible. Rusty violin strings and instable or awkward user interfaces do not *per se* further creativity.

Another example of how the software equally becomes the domain object can be seen by the fact that the composers not only play their instrument. They actually observe, configure and in some cases even build the instrument as part of their creative process. Both composers say that they like to initiate loops or random-based generative processes of music, which they can manipulate and transform by currently changing parameters or adding new effects in the form of filters, reverbs etc. to the circuit. They take advantage of the software as a machine, changing its settings and configurations while listening to the output without any predefined goal. As a mode of production this involves a constant shift of focus between the sounding output and the software.

The software mediated composition and production of music can almost never be described in terms of a single user-tool-object triangle of mediation. In general we see long chains of mediation; from the composer to the music experienced by the audience. E.g. Max/MSP mediates the programming of a Max/MSP patch, but the patch itself mediates both the performance situation (as a filter and instrument), and the composition situation (as a material resistance and as inspiration). Computer applications take several simultaneous roles when used in a creative context, in particular how the alteration of the components between being instruments and objects is so rapid that the distinction almost seems to break down. The computer artefact is not only mediating the (re) shaping of the object, it is also (reference to) representations of modes of acting, and (reference to) derived cultural images of the artefact.

MATERIALITY

During the interviews materiality turned out to be an important aspect of instrumentness. The two composers' absorption of the software has to do with its materiality. They constantly return to talk about the materiality of the software, when asked what challenges and inspires them. It might seem absurd to talk about the materiality in software, which often is seen as dynamic and even immaterial, but still compositional software (as any software) is materialized from the low level of code and algorithms, to the interface, its metaphors and interaction, and to the sound, music and perhaps visuals that are produced as artistic output and how they connect to artistic, musical traditions. The processes and products of the software become form, materialized as text, interfaces, and sound, that is, they become sensuous form with aesthetic, musical meaning with which the composer can work on all levels from the code writing to the interface, and from the sound to the musical and cultural contexts and traditions of which it becomes part. As such, the composers play the software as an instrument (as described above) exploring its material dimensions and resistance. When composing and playing, they are not only occupied with product, the resulting music, but also with the process, its intricacies and challenges.

Artists in general often point to the resistance of the material as an expression of the struggle in which they engage when producing art. The struggle is seen as fundamental for the creative process by which the artist expresses himself. As such the resistance of the material is understood primarily as a positive and even necessary premise.

Materiality can be understood as an embodied resistance in the software the users have to struggle with in order to creatively use the software, and the way in which it supports their aesthetic conceptions and musical poetics. This materiality is not something to do away with in order to make more useable software, but is exactly what constitutes the software as an instrument, as something to play on and with.

When dealing with digital instruments a special aspect concerning the resistance of the material is the metaphorical design of the interface. The sequencer software that one of the composers uses is metaphorically connected to earlier music automata and media forms that deal with music as layers of structures unfolding in time, e.g. pin barrel programmed carillons, the score, player pianos and multi track tape recorders. As such, the continuous scanning of data on different tracks [4] is prominent in the interface and the basis for loop-based music production. Engaging the software they quickly transgress the functionalities inherited within the metaphors of the interfaces, pointing to and taking advantage of more computer specific functionalities such as automated and algorithmic

procedures of manipulation, as when one of the composers automatically cuts up sound samples in rhythmical structures, or when using random algorithms to control the flow of data in the patch cords that connect different objects. Thereby they move beyond the basic metaphors of the software towards how they are implemented as software and become materialized form. A multi track tape recorder is an automatic playback mechanism of pre-recorded layers of sound, but automatically cutting up sound from analyses of volume levels in the source material is beyond what a tape recorder can do. Also, the continuous manipulation of the soundtracks in real-time that one of the composers performs by the use of external control boxes calls for an instrument approach to music composition that goes beyond the normal use of a tape recorder. In the other composers use of Max/MSP he equally moves beyond the synthesizer metaphor of the interface. Although he does connect separate objects by the use of patch cords, his fascination of the software is not primarily caused by the synthesizer functionality, i.e. the possibility of synthesizing sound. It is caused by the programmability of the software and its generative features, as when he sets up rules for the flow of music and allows for the control of sound by the use of sensors. As such, he composes event driven music, i.e. music that is not entirely fixed in time. In short, it is the algorithmic nature of the software that fascinates him.

As mentioned above, the two composers take an iterative approach of listening to and adjusting the machine at hand. As “operators” they involve themselves in computer assisted composition where the software generates musical structures and sound objects that they continuously approve, correct or dismiss. Taking advantage of automated and rule-based procedures they explore the algorithmic potential of the computer and move beyond the basic metaphors of the interface.

METONYMY

The familiarity provided by metaphors in the interface, is important in order for the user to be able to start using the application at hand, but should be complemented with generalisation and mastery. The metaphor is the starting point that necessarily must be broken in order for the user to continue to develop with the tool.

In the two composers’ use of the software tools it is quite clear that the metaphors are systematically violated and transcended. This seems to be a specifically strong aspect of music production; composers and electronic musicians may be particularly sensitive to the problematic lack of dynamics induced by too strong, conservative metaphors. In general, however, interface design supporting creativity may need to explore other means for creating initial familiarity than metaphors. In this section we introduce and discuss the concept of metonymy as an aspect of the instrumentness computer mediated creativity.

Whereas metaphor is a trope based on similarity between domain and object, metonymy is based on contiguity. However, metaphor and metonymy are not restricted to (literary) language, but function in any representational language, such as painting, film [3], and even interfaces. A typical 'text book' example of metonymy is "the crown" for the king. Instead of substituting something with something 'like' the thing as metaphoric translations do, metonymies substitute on the basis of some material or causal relation, e.g. the crown is a material attribute of being the king.

Metaphor and metonymy are not mutually exclusive but competing poles of symbolic representations [3]. They can be applied as design strategies in software interfaces – e.g. using contiguity and material (metonymic) substitutions instead of metaphoric analogies, or leaving the software open for metonymic displacements of the basic metaphors, thus creating less totalitarian metaphors. But metonymy is also often applied through users' (mis-) readings and (mis-) use, i.e. through more or less unconventional and creative uses of the software. As a general vehicle to create initial familiarity in the interface, metonymy is more plastic, enabling (or even encouraging) the users to develop their own ways of using the software.

Interfaces depend on mechanisms to create initial familiarity, as well as representations that enable the user to develop the way he uses the software. Metaphors have been successful but also problematic in the sense that a good metaphor closes the software and locks users unless they are creative people who feel stimulated and provoked to try to break a too perfect metaphor. In cases where the designer cannot expect the user to independently metonymize the metaphor. Basing design on metonymy may be a strategy that provides the user with initial familiarity and still enables creative development in use. Metonymical design is a new way to take users’ perspective into account, and to avoid multimedia tools based solely on the pre-digital counterparts. Especially when making software for creativity, the metonymic possibilities as argued become important for inspiration, for finding original artistic solutions, precision and atmosphere, and for the pleasurable playability of the software.

DISCUSSION

The composers strongly rely on generativity, randomness and stepwise refinement, of emerging structures of sound and music. The result is unpredictable and unexpected, but still controlled. The music originates in a relation between the software in use and the aesthetic conceptions of the composer. This relation is dialectic, and as such the software is not in any simple way a tool for creating music, but through its materiality highly influential of the music produced. This relation is captured in the concept of instrumentness.

The materiality of the software which encompasses both the inherited historicity of music, traceable in the metaphors of the interface, and the unique algorithmic potential of computer technology, e.g. automated and generative procedures, offers the resistance necessary for the composer to express himself in an original way. As such, the materiality of software represents both a history to overcome and a potential to explore. In order to deal with the resistance of the material, the composer has to discipline himself in the use of the software so as to explore its potential beyond the often rather limited view of the basic metaphor(s) applied in the interface. Thus, the software is comparable to a musical instrument since the software becomes the object of his attention and something he explores, tweaks, observes, and challenges in a continuous shift of focus between the sounding output and the instrument. This instrumentness blurs the distinction between (and hierarchy among) the object and the instrument. This is, however, not restricted to music software; in contrast we believe that instrumentness in this sense is a key concept in general interaction aesthetics and applicable to other areas where software is used in creative processes.

What furthers the creativity of the composers is the way the software allows them to reach beyond the initial familiarity of the basic metaphor and take advantage of the proper functionalities of the software. To designate this transgression we use the concept of metonymy, since the metonymy invites the user to reveal a fuller potential of the software than the metaphor often allows for. As such, the metonymy enables (or even encourages) the users to develop their own ways of using the software. As a design principle it gently criticises metaphorical design and underlines the importance of exploring the materiality of software as an important part of a creative process.

Creative use is exploratory, experiential and experimental – it is a way of *playing* (with) the software. Such creativity takes place in al kinds of software use, when configuring, tinkering, etc., but in software for creative processes and production, such as (but not exclusively) software to produce art, it becomes an integral part of use, enabling creativity and inspiration. This first aspect of designing software for creative use is of course related to designing software with experiential, pleasurable and playful qualities that through atmospheric, metonymic qualities attract users and give them a pleasurable use experience. There is, however, also a development-oriented aspect of avoiding the fixed metaphors, constricting user models and narrow conceptions of the domain object. In this aspect, designing for creative use is designing for a user giving him/her the possibility to experience the representations of the software *and* the possibility to go beyond them. The study argues that support for a sense of materiality of the software in its various stages – from code through interface to output – is of key importance. In order to design software for creative use, transcending the boundaries and restrictions of earlier artefacts, instrumentness, materiality and metonymy are central strategies.

The above discussion enables us to revisit the upcoming of the tool metaphor. It seems that the idea of the transparent tool is a concept of the past, as indicated by [2]. However, when taking the dialectic relation between the tool as transparent and as object for reflection as explained by [5] into account, we see a possible retro movement of tool and material orientedness possibly forming with instrumentness as a possible corner concept.

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Portraying User Interface History

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ABSTRACT
The user interface is coming of age. Papers adressing UI history have appeared in fair amounts in the last 25 years. Most of them address particular aspects such as an innovative interface paradigm or the contribution of a visionary or a research lab. Contrasting this, papers addressing UI history *at large* have been sparse. However, a small spate of publications appeared recently, so a reasonable number of papers are available. Hence this work-in-progress paints a portrait of the current history of user interfaces *at large*. The paper first describes a theoretical framework recruited from history. Next the paper analyses a selected sample of papers on UI history at large. The analysis shows that the current state-of-art is featured by three aspects: Firstly *internalism*, in that the papers adress the technologies in their own right with little contextualization, secondly *whiggism* in that they largely address prevailing UI technologies, and thirdly *history from above* in that they focus on the great deeds of the visionaries. The paper then compares this state-of-art in UI history to the much more mature fields history of computing and history of technology. Based hereon, some speculations regarding the future of UI history are offered.

Keywords
User interface history, HCI history, history of computing, history of technology.

INTRODUCTION

Over the years, a good number of papers on historical aspects of user interfaces and HCI have appeared. These largely address a particular innovative interface paradigm such as the Macintosh [19], the role of a particular visionary, such as Vannevar Bush [23], and the contribution of a particular research lab, such as Xerox PARC [14]. In addition, a limited number of papers on UI history *at large* have appared, starting with Gaines in 1984 [9] and Grudin in 1990 [12]. The last year has seen a growing interest in the history of our field. Firstly, a small "spate" of papers on historical aspects of UIs and HCI appeared: Baecker (2008) [2] and Grudin (2008) [13]. Secondly, the publication of the *HCI Remix* book where HCI scholars look back [8]. Thirdly, the CHI 2008 conference in April 2008 in Florence saw a number of events with a historical slant: Bonnie John organized a session on the 25 years anniversary of the 1983 landmark book *The Psychology of Human Computer Interaction* by Card, Moran and Newell [5], Gilbert Cockton revisited Gould and Lewis's seminal 1985 paper on principles of iterative design [7, 11], Jonathan Grudin held a tutorial on HCI history, while Brad Myers and the present author organized a special interest group on user interface history [18].

In spite of these events and publications, the sparcity of works on UI and HCI history is striking in comparison with neighbouring fields. In Human Factors and Ergonomics, the pioneer David Meister published a book on their history almost ten years ago (in 1999) [21] while numerous books have been published in the neighbouring field history of computing, authored by pioneers and historians alike.

Returning to UIs and HCI, my focus in this paper is UI history, not HCI history – although the two are closely intertwined. I consider UIs to be tangible and conceptual artefacts of the world, while I consider HCI to be an academic field of study addressing concepts, theories, and methods. In addition, my focus is on UI history *at large* as opposed to history of selected aspects such as particular interfaces, visionaries, or organizations. Upon this background the paper aims to portray current UI history:

- How are UIs and their development portrayed historically?
- Which historiographic approaches are employed?
- How does this state-of-art relate to the neighbouring fields history of computing and history of technology?
- How is UI history likely to develop in the future?

The organization of the paper largely follows these four questions: First a theoretical framework recruited from history is outlined. Next the sample of papers on UI history *at large* is described, followed by an analysis. Based hereon, the paper characterises the state-of-art of current UI history – quantatively and qualitatively – and makes a comparison to the neighbouring fields history of technology and history of computing. Finally, some speculations on the future of UI history are offered.

A CONCEPTUAL FRAMEWORK

History as an academic endavour is mature and by way of *historiography* (the science of history) offers a set of concepts that enables characterization of approaches in historical writings [3, 26]:

- *Internalism*: Focusses on the functional design and characteristics of the technology itself while excluding contextual aspects.

- *Externalism*: Focusses on the context of technological events but do not discuss the design of function of the technologies.
- *Contextualism*: Focusses on the the technological artefacts as embedded in a social, economic, cultural, and political context.
- *Whiggism*: Stresses a linear notion of development and continuous progress - that fosters the myth of autonomous technology and technology determinism.
- *History from above* and *history from below*: The former addresses great deeds of great men, while the latter addresses everyday life.

Regarding internalism, externalism, and contextualism, the dominating papadigm among historians of technology is contextualism. This is illustrated by the aim and scope of the leading journal *History and Technology* [15] that "seeks to contribute to our understanding of technology as embedded in society, exploring its links between science, on the one hand, and the cultural, economic, political and institutional contexts on the other."

THE SAMPLE OF PAPERS

Given the plethora of publications on UI particulars and the limited number of papers on UI history at large, how to arrive at a valid sample? Given the focus on UI history *at large*, I decided to apply the following selection criteria:

1. Broad and deep coverage of primarily UI and secondarily HCI history.
2. Extensively based on written sources.
3. Reasonably contemporary.
4. In case of sequels, the most recent version.

These quite rigorous criteria match the limited space in this paper – more lax criteria could have been employed. Eight papers met the criteria: Six book chapters and two journal papers. The eight papers cited between 40 and 141 papers – on average 89 – with a considerable breadth and depth (criteria 1 and 2). The papers were published from 1995 to 2008 (criteria 3). In case of three sequels, the most recent versions were chosen (criteria 4). As space here doesn't allow for lengthy analyses, each paper is briefly described (in chronological order).

Baecker's (1995) *A Historical and Intellectual Perspective* [1] (13 pages). An opening chapter in a HCI handbook. Starting out with Memex, Baecker provides a broad coverage of important UIs, systems, technologies, scholars, organizations, professional developments, and the role of neighbour disciplines. No trends or lines are identified.

Shackel's (1997) *Human-Computer Interaction – whence and whither* [25] (17 pages). A comprehensive attempt to outline a history from a European, ergonomic perspective. Based on three periods from 1950 to 1995, Shackel offers trends such as *from system supremacy to personal empowerment* and *from system design to interface usability and back again* - as well as future perspectives.

Myers's (1998) *A brief history of human-computer interaction technology* [22] (11 pages). A rather comprehensive and detailed list of *firsts* in UIs, centered around interaction technology, applications, and software architectures. However sparse in analysis, the paper serves well as a historical repository.

Mayer's (1999) *Introduction – From Logic Machines to the Dynabook: An Overview of the Conceptual development of Computer Media* [20] (20 pages). An opening chapter in a reader on the computer as a communication device and a medium. Starting out with Leibniz, Babbage, and Boole, the first section *From Leibniz to Electronic Behemoths* provides an overview of the conceptual foundation of computation. The second section *From tool to Medium*, starting with Turing and McLuhan, outlines the development of the computer into a medium where the UI plays a central role.

Pew's (2003) *Evolution of Human-Computer Interaction: From Memex to Bluetooth and beyond* [24] (17 pages). An opening chapter in a HCI handbook. Based on five periods – from 1966 and before to 1999 and beyond, the paper provides a comprehensive coverage of the field, centered on contributions of visionaries and how later generations built on their work. No lines or trends are identified.

Jørgensen[1] and Udsen's (2005) *From calculation to culture – A brief history of the computer as interface* [17] (18 pages). A book chapter on the development of the user interface seen as a cultural phenomenon. Based on six generations of traditional and novel UI technologies, the paper argues that the development of the computer from calculation engines to media can be understood as a movement from calculation to culture.

Baecker's (2008) *Themes in the early history of HCI - some unanswered questions*[2] [2] (6 pages). A comprehensive list of unanswered questions, centered around eight important themes in HCI, among these hypertext, interaction design, GUI interfaces, and usability testing. The stated purpose of the paper is to call for research into the history of our field. No lines or trends are identified.

Grudin's (2008) *A Moving Target: The evolution of Human-computer Interaction* [13] (24 pages). An opening chapter in a HCI Handbook. Starting in 1945 and ending in 2005, Grudin's work focusses on HCI, based on six periods. The paper is very comprehensive and substantial. It includes a broad range of aspects such as application demands, research funding, disciplines, and their interaction. The paper's main point is that *discretionary use* is a hallmark of the evolution.

QUANTATIVE ANALYSIS

A cornerstone in academia is references to the literature. It is therefore relevant to ask which seminal papers and which visionary authors were cited most frequently? The paper

[1] I have decided to include a paper coauthored by myself in the the interest of coverage, as the paper is work-in-progress, and as the depth of the analysis is limited.

[2] This paper has significant similarities with Baecker (1995) [1], but is not a direct sequel.

sample comprised a total of 708 citations, an average of 89 papers. Seven[3] of the eight sample papers cited Vannevar Bush's 1945 paper *As We May Think* – that envisioned the modern information machine Memex – and Ivan Sutherland's 1963 paper on *Sketchpad* – that paved the way for implementations. Six sample papers cited Card, Moran, and Newell's 1983 book *The Psychology of Human-Computer Interaction.* Five sample papers cited Licklider's 1960 *Man-Computer Symbiosis*[4] and Engelbart's 1963 paper *A Conceptual Framework for Augmentation of Man's Intellect*. Hereafter, a mix of papers by visionaries (Kay, Nelson) and later HCI researchers (Shneiderman) and practitioners (James Martin) were cited.

As to authors cited most frequently,[5] the authors with 10+ citations were (number of citations in brackets) Licklider (16), Nelson (16), Norman (14), Card (13), Engelbart (13), Kay (12), and Shneiderman (12). The difference between the two measures (most cited paper and most cited author) illustrates the breadth of the authors' contributions: Vannevar Bush wrote but one article relevant to HCI and UIs, while Ted Nelson and Donald Norman have written many.

QUALITATIVE ANALYSIS

As to the style of the papers, there are significant indicators of internalistic style. The papers' expositions do not in general address cultural, economic, political, and social factors. All the papers - except Mayer's who is from media studies - are authored by scholars of the HCI field – a typical feature of internalism.

The principal line of argument in the papers is that the prevailing UIs – the GUI and the Web interface – build more or less directly on the work of the early visionaries: Bush, Sutherland, Licklider, Engelbart, Kay, etc., expressed as a string of pearls: Memex, achievements at Stanford Research Institute (SRI) and Xerox PARC, Apple Lisa, Apple Macintosh, Microsoft Windows, etc.

Blunt examples of technology determinism are found in the papers. Grudin states "Moore's law ensures that landscapes will continue to shift, providing new forms of interaction to explore and new practices to improve" [13, p. 20]. In addition, Baecker writes "Because our work has transformed the way human beings create knowledge, learn, think, communicate, and collaborate, we must record and understand our history" [2, p. 22]. While most historians agree to the last point, many historians would tend to disagree with the causality in the first point.

The papers rarely touch upon the life of users and their needs. Also, the realm of the practicising user interface designer is hardly addressed. To illustrate this point the highly successful and widespread IBM 360/370 family of computers, that dominated the market for several decades from the mid 1960, employed the 3270 screen protocol. Myriads of users worldwide have been struggling with 3270 interfaces developed by other myriads of user interface designers struggling with 3270 screen tools. Hence the styles *history from above* and *whiggism* seem to be represented abundantly. Historians Black and McRaild comment on this issue [3, p. 113]: "Of course, 'history from below' is not a separate discipline. It does not exist in a vacuum, nor does it survive without reference to the 'history from above'. *The wider social structure cannot be ignored, nor can the actions of elites* (my emphasis)."

WIDER PERSPECTIVE

How does this look in a broader perspective? Let's direct our attention to the two adjacent fields history of technology and history of computing. In these fields, studies of their evolution have been conducted. In history of technology, Staudenmaier [26] performed a thorough analysis of the 272 articles published in the prestigious journal *Technology and Culture* from its beginning in 1959 to 1980. He found a movement from internalism to contextualism as historians entered the field. In history of computing, the leading journal is *IEEE Annals of the History*. Holmevik [16] analysed 143 articles published in regular, non-special issues from its beginning in 1978 to 1993. He found that contributions in the first years by computer professionals vastly exceeded thoseby historians, that Whiggism featured those contributions, and that internalism dominated these early years – and that this balance tended to change.

Changing from journals to books, two of the most respected books by pioneers are by Herbert Goldstine from 1972 [10] and Maurice Wilkes from 1985 [27]. Contrasting this, the two most acknowledged books on computer history written by historians appeared much later: by Campbell-Kelly and Aspray in 1996 [4] and Ceruzzi in 1998 [6].

Hence it seems that the history of a certain (technological) field is sparked by its pioneers while historians gradually chime in, causing a change from personal experiental reports (internalism and whiggism) to wider analyses including political, economical, social, and cultural aspects (contextualism). The question is then, if this also applies in UI history, i.e., the pioneers are establishing a history, and that a similar movement towards wider aspects by historians can be expected later? There are strong indications that we are in an early state in UI history where the connections between the technical particulars and the social and cultural aspects remain to be explored. Look for example at the following three consequtive subsection titles in one of the eight papers [24]: "Interface Builders", "Donald A. Norman", and "HCI as a professional field (1978-1988)" – quite a mixed bag!

Given that historians study the past and that they usually consider the "past" to be at least 15 years old, it is surprising that no historians so far have addressed UI history. If the development in UI history follows those in

[3] No papers were cited in all eight sample papers.

[4] In the interest of space I have not included the full bibliographic references to these works.

[5] In this scoring, citations to the author's own papers have been disregarded; as Shackel [22] cited his own work 15 times, he would have headed the list.

history of technology and history of computing it will take quite a while before historians will chime in and balance the contributions by HCI scholars and pioneers towards more contextualism and thereby establishing a more thorough understanding of our field.

In conclusion, the current literature in UI history at large is sparse. Portraying it reveals features of internalism, whiggism, and history from above. However, this portrait is similiar to the earlier state of affairs in the neigbouring fields history of technology and history of computing where historians later entered and helped provide social, political, economic and cultural contexts.

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The challenges of HCI research

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ABSTRACT

Despite the increasing use of information technology, it appears that HCI research during the last ten years has become less important. This paper describes what can be done to improve the position of HCI research. It describes the general principles of the evolution and propagation of research ideas, applies these principles on earlier and current HCI research and describes ways that HCI research may improve its position.

Keywords

Design, Future, history, methods, practitioners

INTRODUCTION

The use of computers have spread more rapidly in the last thirty years than any other technology in the history of mankind, and HCI research has been a key area in that development. In spite of that, it appears that the influence of HCI researchers has decreased during the last ten years. I will therefore investigate the possible causes and discuss what can be done to avoid that HCI as a research area will stagnate and become increasingly unimportant.

A MODEL OF THE EVOLUTION WITHIN A RESEARCH AREA

The development within a scientific area can be seen as the result of a loosely connected evolution of ideas, where different attempts to act rationally interact with other forces that influence the development as for instance social values in the society, career opportunities and available resources. (In the following I will use the term ideas as a common term to designate observations, methods or opinions that are formulated so they can be communicated.)

According to Dennett, an evolutionary development of ideas requires three elements:

- Copying of ideas, so they may spread [2]. That happens for instance when a scientific paper refers to an earlier paper, or when someone reads the paper and applies the idea in a specific design
- Mutations or changes [2]. These happen for instance when someone quotes part of the account of an idea and adds his or her own comments, when the person who applies the idea in a specific design does it in a slightly different manner than described or done earlier, or when a seemingly new idea is created based on earlier ideas.
- Selection, so some versions of an idea disappear, and only the versions that have a competitive advantage are spread [2]. The selection may for instance happen when an experiment shows that one version of an idea is better than another or because one version becomes adopted by a large company and a de-facto standard.

I have briefly described this evolutionary view in an earlier paper [11]. The paper describes how ideas may spread in different partly interconnected environments: among researchers, among practitioners in private companies and among consumers who may accept or reject products that embody a new idea.

Ideas spread more easily within an environment than from one environment to the other because the characteristics of ideas that spread most easily depend on the environment [11], and because persons within the same environment in general are more connected than persons in different environments.

The evolutionary view describes how ideas in a human environment gradually can become more useful and acceptable, without any overall guidance or sense of direction, simply because some ideas have a competitive advantage. Rogers [10] describes in more details some characteristics that may give an innovation or a new idea a competitive advantage:

- Relative advantage compared to what earlier has been used.
- Compatibility with existing values and habits.
- Trialability, which means that the innovation or idea can be tried before a full commitment is made.
- Observability, so other can see the innovation or idea and become aware of it.

It is important for the discussion of the development of HCI that an idea may have a competitive advantage in one environment, where it is compatible and offers a large relative advantage, whereas it may have no competitive advantage in another environment where it is incompatible or offer no relative advantage.

PIONEER HCI

The field of HCI was established during the eighties and nineties, when computers, mobile phones and the internet were introduced as common work tools and consumer products. This created a need of interfaces that were easier to use, and it was obvious that it in most cases was not feasible to employ human factors experts to work on new interface designs.

Interface design within the human factors approach was regarded as an expert area in the construction of airplanes and complex systems, similar to electronics or structural engineering. It required practitioners with a university degree in cognitive psychology or ergonomics, and used precise, but complex methods as for instance GOMS that makes it possible to calculate the time a user needs to complete a range of physical and mental activities [9]. Such an approach was not feasible, if usability and interface design should become a normal part of large and small software projects.

The solution was to introduce a number of methods that seemed so easy to learn that software designers and other without any psychological background could apply them almost immediately. Nickerson and Landauer wrote [6]: "User testing is straightforward. Users try, the tester watches, notes errors, times tasks, later asks questions." In a similar manner, Jakob Nielsen [7] introduced "discount usability engineering", and stated [8] that a "large proportion of the problems one observe in user interface design" can be explained by just ten rules that can be described on less than one printed page.

Researchers adopted or were inspired by ideas from psychology, graphic design, anthropology and sociology. However, specific methods from other areas were often adopted without taking into account the assumptions the methods were based on, or the discussions of their limitations and use that occurred in the academic areas from which they were adopted. That made sense, when the goal was quickly to strengthen the area of HCI, and the approach was compatible with the values within computer science, where it is common to experiment with a new method based on a minimum of knowledge about it, and to adopt it, if the results seem to make it worthwhile.

HCI ideas spread rapidly, even through do-it-yourself descriptions in popular magazines, and researchers and practitioners found it easy to change ideas and methods in order to create their own variations. In contrast, the selection was quite weak. That can be seen in proceedings from scientific conferences at that time. A number of articles resemble personal accounts, and some articles with creative ideas were accepted even though the reliability of their results was not documented.

The notion seemed to be that any knowledge about usability was better than nothing, which is a rational view for researchers within a rapidly developing new discipline, as well as for practitioners for whom any reduction of the uncertainty in interface designs was advantageous. The environments of researchers and practitioners were partly overlapping and not clearly separated. Practitioners presented their products at scientific conferences and researchers took part in interaction design for industrial software development.

When computers, mobile phones and later the Internet was seen as something new and unknown, it was possible for members of the HCI community to gain an entrance into established fields as communication, marketing and social science studies. When few other people investigated the use and consequences of the new technology, the ideas of HCI researchers had a comparative advantage, even within other areas where HCI researchers had limited experience and theoretical knowledge.

The informal approach to learning HCI made it easy for software developers and other to enter the field of HCI. They experienced a good triability. That was also the case for managers of software projects. They could for instance do a usability test in a single project before they decided to introduce usability testing in their normal development process. The relative advantage appeared to be obvious, when there earlier had not been any methods for ensuring a minimal level of usability, when any knowledge about possible usability problems clearly was better than nothing, and when usability problems frequently were discussed in public.

HCI work was compatible with the existing values and habits in software development, as long as it focused on evaluations and testing that could be done with only a minimal influence on the normal process of software development, and the informal approach to learning it was compatible with the notion among software developers that formal education was less important than the ability to learn a new skill quickly.

In contrast to the human factors approach, HCI had all the characteristics that were necessary to ensure a rapid growth of the area.

HCI TODAY

Scientific work is normally regarded as a progressive process where the available amount of ideas are improved and expanded. However, if we regard the development of scientific ideas as an evolutionary process, it is possible for a scientific area to stagnate. There may still be generated new variations of ideas, but they will be less diverse and it is less likely that a new variation shows a relative advantage compared to the existing ideas.

According to Kuhn [4] a new paradigm may then be accepted and revitalize the area. However, that is by no means certain. As described by Horgan [3], it may become increasingly difficult to generate new knowledge within an area, and Rogers [10] describes how a practically oriented

area may run out of ideas to inspire further research. In evolutionary terms, it becomes increasingly difficult to generate new ideas or variations of ideas with any competitive advantage.

This may happen within HCI. When the number of variations of ideas within the area increases, it becomes more difficult to generate new ideas or variations of ideas with a competitive advantage. For instance ideas or variations that offer a solution to an existing problem that is substantially better than any of the earlier solutions. Even ideas or variations that offer documented benefits may not be accepted. As in other mature research areas, individual researchers have generated a body of ideas, that their career and reputations to a large extent are based on, these ideas are spread through textbooks and they are parts of curricula. Existing ideas will therefore always have some competitive advantage compared to any new variations of ideas. (It may in particular be difficult to get small beneficial variations of existing ideas accepted, because it does not seem worthwhile to change the existing basis of ideas to accommodate them. This is in spite of the fact, that small changes to ideas are more likely to be beneficial than larger ones.)

The focus of scientific articles in a mature area is no longer to communicate experiences that may be useful for practitioners, but to document results so other researchers can quote them. This is how the reviewers, who evaluate the articles, expect to use them. Reliability is considered more important than the validity of studies, because the validity in most cases is easier to evaluate. This favors in particular quantitative comparative studies, even when such studies are done under circumstances that are invalid for practical applications. The research environment values precision which often requires complexity, and it is easier to change ideas by making them more complex than by simplifying them, so new ideas tend to become more complicated and more difficult to use for practitioners. The consequence is that researchers and practitioners are split into two different communities with only limited contact.

There are a large number of skilled practitioners. It is easier for them than for researchers to determine, if a new design is feasible in the specific application domain where they are working, and whether it offers some advantages and because they are part of the environment that produce new applications, it is in general easier for them than for researchers to get their designs implemented.

The number of practitioners is larger than the number of researchers, so they are potentially capable of producing a larger number of variations of designs. In addition, they are more inspired by the designs other have made. This way of working is similar to what Claude-Lewi Strauss describes as bricolage [5] or the use of available pieces to solve a particular problem. It is more compatible with normal practical work than the use of results from scientific articles. It is also in general faster and safer to use a design that already has shown some potential on the market, than to use a design based on a scientific article.

The adoption of ideas from a number of different fields and the change of them into easily applied methods makes it difficult to discuss the professional identity of HCI practitioners and researchers. They are involved in software development, but in most cases without really being software developers, they are using methods and discussing problems similar to those in social science, while demonstrating a predominantly technical background.

Computers and other information technology has become part of most aspects of human life, and researchers in different areas of humanities and social science have become familiar and comfortable with them. This means that development psychologists, organizational researchers, anthropologists and media researchers work with HCI related problems within their own area, where they have a better theoretical and empirical basis than HCI researchers. In total they have substantially more resources available for working on HCI related problems, and the media coverage indicate that they are better than HCI researchers at spreading ideas in ways that are interesting for a broader group of users and practitioners.

The basic principles of usability or ease of use have become well known and generally accepted. This means that the most interesting research problems today are related to the ways that people interact with computers and different electronic media, and how we may design them – computers and media, not the people – so they are used in a desired and positive manner. Not only will researchers in other areas have a better basis for exploring new aspects of HCI. The new aspects may be the most essential for the design and adoption of information technology today and in the foreseeable future. Outside the research environments, ideas about HCI related topics from other disciplines seem to have a competitive advantage compared to ideas from HCI researchers.

Finally, it has been extremely difficult to get HCI integrated in current software development processes. It is likely that current HCI methods in general are incompatible with the values and habits of software development, so a successful integration or just more widespread use of HCI ideas in software development, so an improved integration either requires new HCI methods that are adapted to the values and ideas of software development, or a change in the values of habits of software development, similar to what is required top introduce agile methods or CMM (the Capability Maturity Model).

DISCUSSION AND CONCLUSION

This paper describes that we today have one environment with HCI researchers and another with HCI practitioners, only a limited contact between the environments, and

where ideas that have a competitive advantage in the research environment in many cases cannot compete and propagate in the practitioner environment. It is then likely, that the area of HCI is becoming increasingly irrelevant.

I will like to discuss some of the arguments *against* such a development:

- Adopting a specific new idea, for instance a new method or a specific theory to guide HCI work, can solve the problems within HCI. Different researchers have suggested a number of specific new ideas. However, none of them have been able to show that their ideas had such a large competitive advantage that they have been generally accepted.
- There are more papers published than ever before, and the competition to get papers published is harder than ever before. A hard competition may even accelerate the stagnation of a field, if the consequences are that a more narrow range of ideas are published, or if the variation in the papers mainly is caused by attempts to find something publishable and not necessarily to progress the field.
- There are more researchers than ever before. The recruitment and abandonment of an area lags behind its development. It is therefore not unexpected that the number of researchers within a field may reach its maximum when it is stagnating.

If we accept the contents of this paper, it is possible to find ways to improve the general position of HCI research.

HCI can be made more relevant by listening to the needs of practitioners and by finding ways to solve the problems they experience. That is in particular advantageous, if an effort is made to find ways to encourage and value the publication of results that are useful for practitioners, instead of focusing on the publication of articles that mainly are written to be quoted by other researchers. It may also be possible to improve the whole publication process, which to some extent is designed to fit the needs of the pre-internet era.

The large and creative environment of practitioners can be used to strengthen HCI research. It is possible to focus part of the HCI research on the registration, classification and evaluation of design ideas created among practitioners. One advantage is that the invention and design of new ways of interaction is the part of research it is most difficult to standardize and make more effective, whereas it is much easier to set up standard procedures for classifying and evaluating new design ideas.

It is possible to collaborate more closely with other research disciplines that work on HCI-related topics, and in particular to utilize the experience of researchers in these disciplines. An HCI researcher may for instance work with anthropologists on a study using anthropological methods, instead of trying to apply these methods based on a more superficial knowledge about them.

Such collaborations are only possible, if HCI researchers have something to offer other research disciplines. This requires a discussion and a re-thinking of the professional identity of HCI researchers and practitioners, so it is possible to identify the strengths that HCI researchers have compared to researchers from other areas. Some of these strengths may not be related directly to what we normally regard as HCI research.

I have criticized the superficial manner in which HCI research has adopted methods and ideas from other areas. However, compared to other areas HCI research has a large experience in ways to combine ideas from different research areas. This is a professional area, a sort of meta-methods where it is possible for HCI to build a strong position. Compared to other academic areas, HCI has a large experience working with industry in the borderland between research, design and product development. It is something that also can be found in some design and technical areas, but rarely in social sciences and humanities. I have also experienced that HCI, compared to social sciences and humanities, has a strong tradition for focusing on a specific goal in order to produce ideas that can be used as a basis for new or useful designs. That may actually be a more essential element of HCI than the ability to do usability testing and inspections.

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The Potential of Genre Theory within E-Governance Web Applications

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ABSTRACT
In this paper we explore the potential of applying the concept of genres in the development of E-governance web applications and hereby enhancing user experience. Specifically we propose the existence of three genres within the body of Danish E-Governance related websites, and suggest using genres by breaking or mixing them to enhance user experience.

Keywords
Genre, E-Governance, User Experience, SKAT

INTRODUCTION
The CHI *Proceedings* and conference *Summary* are the records of the conference. As in previous years, we hope to give the books a single, high-quality appearance. To do this, we ask that authors follow some simple guidelines. In essence, we ask you to make your paper look exactly like this document. The easiest way to do this is simply to down-load a template from [2], and replace the content with your own material.

INTRODUCTION
Just as a good book, on-line solutions present the user with an experience, no matter how dull the function of the website might seem. Sometimes the technologies with the least exciting appeal might be the ones that benefit the most from a touch of thriller, on-line shopping or even science fiction.
Much like other artistic expressions, there lies a great potential in thinking technology as experience. Not because it is a new concept, a neglect of genres, but because that is what technology does to us. It changes our daily life, the work we do and the way we experience the world in which we live. Just as a great book fits within or transcends genres so does technology. Authors and designers alike work their way into, or out of the expected and in doing so design experiences for the receiver, the reader and the user It is exactly this area of expectation, categorization and experience that we will scrutinize in this paper—specifically within the area of EGovernance web applications.

METHOD
This short-paper is a preliminary exploration of a methodical design potential—namely the use of genres in software development. Concretely we explore the introduction of the concept of genres to the world of E-Governance web applications. We do this by, on the one hand, theoretically discussing the introduction of the literary concept of genres into the world of usability and design. On the other hand we empirically and practically explore the application of the concept of genres in the perception of a Danish governmental web application—SKAT's on-line self-service. We analyze this web application by an exploration of the E-Governance area and in doing so propose a set of genres existing within this same area. We link these genres to the theoretical foundation, which we introduce in the first chapter of this paper.

THE CONCEPT OF GENRES
According to Andersen [2, p. 32],"Genre theory is not about text types in isolation, but rather about the fact that recognising (as both producer and user) a particular text type means recognising a particular communicative situation and activity in which that type of text (genre) is used to accomplish a given task".
Two schools exists within the literature of genre; 1) The North American school, which locates its understanding of genre in relation to how people, texts and activities interact with each other in order to produce meaning and knowledge for action; and 2) The Sydney school, which is primarily founded in systemic functional linguistics [1]. Since the more holistic view provided by the North American School is expected to provide a more complete picture of the artefact analyzed below, this line of thought functions as our point of departure.We clarify the North American school on the basis of two genre theories, namely Swales [11] and Berkenkotter & Huckin [3] below.
One prerequisite for Swales' [11] understanding of genre is his definition of discourse communities. Thus, he sees discourse communities as pivotal to understanding of the use and emergence of genres. On this basis, discourse communities are characterised as having common sets of goals, mechanisms of intercommunication between the

members, as using participatory mechanisms to provide information and feedback, using genres to assist their goals, and finally as possessing specific vocabularies. In this light, five characteristics comprises Swales' notion of genre. Basically, a genre consists of intended communicative events of varying frequency. The genre has got an overall common purpose within the discourse community which is more important than e.g. content and form. Within the genre, there has to be some kind of similarity between the entities. On the other hand, one should not be too narrow, when including entities into a genre. When grasping the nomenclature of a given genre, people who are highly involved , i.e. people who professionally, routinely and/or frequently operate within the discourse community, are important sources [11].

Berkenkotter & Huckin [3] emphasize the necessity of genre knowledge to researchers and scholars as a means of success within research areas. It is hardly surprising, that parts of the empirical basis of their book consists of studies of scientific literature. A number of closely interconnected principles comprises their conception of genre knowledge. First of all, genre knowledge is dynamic, because it reflects the changing sociocognitive needs of its users. Further, it is adjusted to given situations, because it needs to be recognizable. Besides plain rules for text, situatedness and dynamics must be taken into account, when it comes to the form and content of the genre. In this manner, genre knowledge becomes one among a number of different expressions of social structures within a community, but also an expression of the communities norms, epistemology, ideology, and social ontology [3]. In other words, the genre is constituted by the people using it.

Combining the key elements of the characteristics identified by Swales [11] and Berkenkotter & Huckin [3] respectively offers a framework for moving into the discourse of user experience regarding technological artifacts, which constitutes the content of the next chapter.

GENRES AND DESIGN

The authors' motivation for bringing the above mentioned concept of genre to the world of software design ultimately has to do with categorisation, indoctrination and technology as experience. In the following we elaborate on the connection between these concepts and why we see the concept of genre as defined above, as a strong tool in designing technology with user experience in mind.

Are genres categories?

The act of categorization and standardization is of fundamental value to our cognitive, as well as organizational abilities. As such the act of categorizing and standardizing has been a tremendous factor in the industrialization of society from the development of the American railroad [5] to the mapping of diseases [4]. The cognitive act of categorization makes us able to reduce complexity and focus on the essential.

To a certain extent we see genres as categories, albeit a very specific sort of category. Genres can be seen as categories of communicative artifacts such as books, music and movies. Actors within the wide spread world of literature to a large extent agree on many traits of e.g. crime novels, but then again almost certainly also disagree on other traits. Genres can be seen as archetypal categories that are continuously re-negotiated by the actors who contribute to and make use of the genres. Genres are as we have established by now, not mere categories. This is why we do talk about categories of rocks, but do not talk about genres of rocks. They are pervaded by intentionality, history, communities of practice, negotiation etc. The evolution of genres is not a simple matter and thus one of our greatest challenges as researches is to try and unfold this proliferation. And this is where we encounter challenges in our introduction of genres into the world of software design. Authors consciously and unconsciously write themselves into and out of genres. This is why genres should be understood as both descriptive and prescriptive. Descriptive because they form expectations in the mind of the reader. Prescriptive because writers purposefully include and exclude genre-traits to surprise the expecting readers. Lacey [8] refers to this distinction between description and prescription as the conundrum of the chicken and the egg: Which came first; the descriptive or the prescriptive function of genre? This conundrum is a manifest of an inherent conflict between idealism and empiricism; the former considers the elements of a genre, the latter at the actual texts constituting the genre [8, p. 212]. This raises the question of genre-breaking.

GENRES IN E-GOVERNANCE

When looking at websites and web applications related to SKAT, we will use the term e-gov applications, but in a somewhat wide definition of the term. The "e" stands for electronic, in this case we are talking about web based solutions. The "gov" stands for government or governance [7], in this case this is not only institutions related directly to the state, but also private companies or organizations that serve a purpose in the daily lives of the public—public as opposed to the consumer. In this manner we include companies like the Danish postal service, banks and workers' unions in our definition. We consider the e-gov applications as expressions of an overall e-gov discourse community [11].We will through family resemblance [11] define the genres representing this discourse community.

Informational e-governance site genre

We see a family of e-gov applications taking the form of informational sites, we will call this genre the informational e-gov genre. These sites have information towards the public closest to heart, though they can have corners of the application allowing flow of information in the opposite direction. Examples of this genre would be local government websites (e.g. aarhuskommune.dk and kk.dk),

the police (politi.dk), and sites like: nyidanmark.dk, forbrug.dk, postdanmark.dk and various unemployment insurance fund sites (like hk.dk/akasse and aak.dk).

These sites all have a similar structure and visual look. They are all based on a three column layout. The top shows where you are, maybe with a small line underneath holding links to the different areas of the site. In the three columns, the left column is used for navigation, the middle column is used for content (and is wider than the others), and the right column is used for related information. The information is delivered in small blocks of polite explaining text. Information within the often separated areas is structured as a tree structure of a shallow or medium depth—avoiding very deep structures.

If the information leads to the need for information submitted to the institution, this is usually done through PDF documents, that can be filled out, printed and posted (or in some cases even has to be printed before they can be filled out), in rare cases small comments or requests can be submitted through a small form directly on the site.

Visually these sites have a professional but colorful look, sometimes incorporating colorful pictures with a very positive feel—pictures you would expect to be used in advertisement, often showing smiling people and nature settings.

Self service e-governance application genre

The self service e-gov application genre encompasses web based applications for submitting information to an institution as their primary function, often with information to the public about the context, procedures and rules of the area as a secondary goal. Examples are: kot.dk, min.su.dk, virk.dk, dinboligstoette.borgerservice.dk and skat.dk. Further, home banking and the part of unemployment fund sites, that requires log in, are considered genre entities. In case of the unemployment funds, their sites often change from one genre into the other, when you enter their self service part.

The communication is based around hard facts in forms, explaining text is often hidden—though often only a click away, this information will often open in a separate window, or it will be placed out of view at the bottom of the page or in a separate guide. The structure of the site is usually a single shallow tree structure, giving an relatively easy overview. Visually the applications are simple, using only few different colors and no images. If forms do not take up the entire screen space, this space is left blank, concentrating on the input forms. In our studies of the user experience of SKAT's web self-service one of the main findings was that the temporal build-up of events is generally a large investment of engagement leads to a possible reward in the end. E.g. patiently going through a large menu system might lead you to the right place or thoroughly filling in a large form may at the end provide you with information or the feeling of obligations fulfilled

Sandbox genre

The sandbox e-gov genre is emerging in the e-gov area. The included applications let the user play with and personalize her data. Focus is on the user's interaction, and the application allows visualizing, organizing, manipulating and the building up of data. Some data is gathered automatically by the application's back-end, supplying the rest is part of the user experience. The temporal build up of events as providing information and receiving feedback can be reorganized. The efforts needed to provide information and the invested engagement is immediately rewarded.

Our best example is minbolig.elsparefonden.dk. The application lets you order or draw the floor plan of your home and place furniture and electrical devices. Then the application calculates your power consumption and gives tips to preserve energy. It also helps monitor your actual power consumption over time, helps users to stay on the right track when trying to lower their power consumption, and it even allows for remote control of an intelligent home. The site uses interactive maps, introductory video and a colorful, rounded and very visual interface. Also tabs with icons— instead of textual links—to switch between different views are used.

A last example, that to a certain extent might belong to this emerging genre, also lets the user organize data in her own way. The secure mail system e-boks.dk lets users receive mail from different institutions (e.g. banks, the government, and unions) and stores them securely. The application lets the user organize her mail in categories and subcategories to her own liking, and later helps to automatically sort new mail according to this system.

Due to the few entities, this genre does not yet seem well defined, but these applications all have a more playful approach centered around the user's experience of the data. User data can be migrated automatically from databases which eliminates the user's burden of supplying the information herself. Instead the user can focus on what could be perceived as playful manipulation of the application. Especially minbolig.elsparefonden.dk seems inspired by simulation games such as Sims, Creatures, Sim City and Spore where the joy of playing is not necessarily linked to winning. An example of this is Sim City where an alternative object might be creating an aesthetically satisfying city as opposed to earning points. Much in the same way the user might spend time arranging her apartment with electrical appliances and furniture, even though this does not contribute to the officialgoal—an overview of electricity consumption.

Discussion of genres in e-governance

In our description of these genres, we have looked mostly at the structure and form. However the different intentions expressed in the genres quickly seemed obvious. These intentions may to a certain extent have dictated design

choices— when the user is filling out a form, one does not wish to distract the user from this task. As opposed to this, when a user is surfing for information, guiding the user's attention to related areas is part of the goal.

While we see overall e-gov as a discourse community, other discourse communities might be at play. Building websites and web applications is usually outsourced to web designers and programmers. While functionally simple informational websites are often handled by web designers, more advanced web application will more likely be handled by people with more traditional programming experience. Web designers might swear to a preferred layout, or use a content management system (CMS) that imposes certain design decisions. Programmers might tend to focus on the back-end, or simply prefer simple solutions—or they might do a usability analysis and base the front-end design on this. In either case, design choices will be made by the people developing the application, while other design choices will be made by the organization behind. These discourse communities will develop genres, that can be recognized by users.

While sticking to a genre will help acceptance of an application, mixing genres conveys creativity [9]. Genres can be intentionally broken or mixed to enhance functionality, or to build a completely different user experience.

CONCLUSION

The concept of genre provides a theoretical frame for analysing different instances of communicative events on the basis of different characteristics and functions. Genres can be seen as a specific kind of categories inherent with intentionality boundaries, traditions and communities. Two ways of applying genres to the world of software development can be established: 1) application of sub-genre instances like thrillers or science fiction. or 2) establishment of a new set of genres within the the conceptual frame. Both have a strong potential as they present strong tools in designing technology as experience. Experiences which can both be comforting and conventional, as well as surprising in their breaking down expected boundaries. The concept of genres and the genre mixing technique helped us in getting creative—and perhaps innovative—ideas for improving e-governance applications. We do believe that genre mixing is a useful tool in the design process.

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The WPU Project: Web Portal Usability

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ABSTRACT
The Web Portal Usability (WPU) project focuses on usability in the development of modern web portals. Web portals are a key part of software development. They are created to provide a group of users with access to a collection of internet services. State-of-the-art methods for usability engineering have only had very limited influence on development of web portals. The methods are costly to apply, they take a considerable amount of time, and they require a system that is nearly completed. This implies that the methods are rarely applied. When they are, usability problems are detected late in the course of the project, when there is neither time nor financial possibilities for solving the problems.

The objective of the WPU project is to develop new methods for usability engineering in the development of web portals and to test these methods in companies that develop modern web portals. The result is a catalogue of methods that support usability engineering in web portal development, combined with guidelines for use, training programmes and documented experience from deployment and use of the methods. The WPU project is a collaborative effort between researchers from Aalborg University, Department of Computer Science and two software organizations that develop web portals.

Keywords
Web portal, software development, usability evaluation

BACKGROUND
Usability evaluation and user interaction design are two key activities in the development of an interactive system. The two activities are mutually dependent, but in practice there is often too little or no fruitful interplay between them [8]. Considerable efforts have been devoted to improve the interplay between usability evaluation and software development. A substantial part of these efforts reflect two typical approaches.

The first approach focuses on better methods. The aim is to improve the products of usability evaluations through use of methods that provide better support to the evaluators that carry out usability evaluations. During the last 20 years, a whole range of methods have been developed within this approach. A prominent and influential example is Rubin [15] that covers all activities in a usability evaluation. There are many others that cover all or some selected evaluation activities.

The second approach focuses on better feedback. The aim is to improve the impact of usability evaluations on user interaction design. This is achieved in a variety of ways, typically by improving the format that is used to feed the results of usability evaluations back into user interaction design. The classical format for feedback is an extensive written report, but there have been numerous experiments with alternatives to the report; see Høegh et al. [9] for an overview.

Compared to both of these approaches, website development is particularly challenging. Websites exhibit a huge and unprecedented amount of information, services and purchasing possibilities, and the users of websites are a tremendously heterogeneous group that use websites for a multitude of purposes any time, any place. Due to this, website developers must accommodate a massive variety of user preferences and capabilities. Many contemporary websites suffer from problems with low usability, e.g. an investigation of content accessibility found that 29 of 50 popular websites were either inaccessible or only partly accessible [17]. This is in line with the suggestions that usability evaluations of websites should focus on the extent to which users can navigate the website and exploit the information and possibilities for interaction that are available [16].

INTRODUCTION
The challenges of developing web portals with a high level of usability originate from two major sources. First, projects that develop web portals usually have a very short duration. This pace makes it particularly difficult to include any type of activity that makes the development deviate from a direct course towards the end product. Second, the users of most web portals are exceedingly diverse. Many web portals have users with any kind of background both in technology in general and the subject area of the portal. Simple examples of this are portals for public administration or on-line banking services.

Usability is "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" [10]. The purpose of conducting usability evaluations is to facilitate a feedback loop where the results of a usability evaluation are fed back into the software development activities that create and shape the product in order to enhance usability [8]. Leading producers of software products have demonstrated how systematic work with usability in software development can create a competitive advantage (e.g. the user interface in the first generations of Nokia mobile telephones). Moreover, many user organizations are beginning to state specific demands for usability in their software requirements specifications.

State-of-the-art usability engineering methods have only had very limited influence on web portal development, because they provide very few solutions to the main challenges. A core area in usability engineering is usability evaluation which is conducted to systematically assess the usability of a software product [6][14]. The conventional methods for usability evaluation (e.g. [4][15]) are very resource demanding [1]. An evaluation with one of these methods can easily require 100-150 person-hours and last about a month. Moreover, the conventional methods are based on products that are executable at least to some extent. This implies that usability evaluations are often conducted towards the end of a project, at a time when substantial changes are impossible and modifications are most expensive [12]. Finally, the conventional methods need to be carried out by experts in usability engineering. There have been some successful attempts to create methods that reduce the demand for time, e.g. inspection methods [5][13]. Unfortunately, these methods require even more usability expertise, which is a bottleneck in the software industry. Thus the need for involvement of experts who are also outsiders to a project makes it impracticable to conduct usability evaluation in web portal development. The reliability of the early inspection methods have also been questioned (most notably by [11]).

The obstacles against deployment of usability engineering methods in web development are unpleasantly apparent from the low level of usability on many web portals. There is a large array of research documenting that users have serious problems when they use web services, they waste large amounts of time, and they often give up before they are anywhere near completion of what they came for.

The WPU project is based on the following hypotheses:

1. The usability of web portals can be improved considerably through application of relevant usability engineering methods.
2. It is possible to develop usability engineering methods that are directly relevant to web portal development and reduce the demands for resources and expertise to a level where they can be integrated in web portal projects.

The aim of the WPU project is to develop and experimentally test usability engineering methods that confirm these hypotheses.

OBJECTIVE OF THE PROJECT

The scientific objective of the WPU project is to develop and test new methods for usability engineering that are considerably faster than existing methods and can be used by typical software developers instead of usability experts. The new usability engineering methods are directed towards web portals which is both a key area for software development and a particularly challenging area. The methods will be tested through full-scale use in web development organizations.

The societal objective of the WPU project is to contribute to creation of web portals with a significantly higher level of usability. Usability problems are a major obstacle against efficient provision of web-based services directly to citizens and enterprises. New methods for usability engineering that are directed toward web portal development will contribute to alleviate these problems and thereby improve digital public administration and efficient service provision.

The commercial objective of the WPU project is to provide web development companies with new methods for increasing the usability of their products, with practical guidance on the use of these methods as well as training programmes for developers in the application of the methods. The methods, guidance and training will be based on documented cases from deployment of these elements in the web portal industry.

MAIN RESULTS OF THE PROJECT

The WPU project will produce the following results:

- A set of new methods for usability engineering in web portal development
- A set of guidelines for selection and application of the methods
- A training programme for web portal developers
- Research training for 2 PhDs and a post-doc

The set of new methods will form a catalogue with usability engineering methods that can help developers solve specific usability problems in web portal development. An example is a method that a developer can use in order to inspect the usability of a web page.

When developers face a usability problem, they need to select a method in the catalogue that is useful for solving the problem. To facilitate this selection, there will be guidelines to support the selection of methods for solving specific usability problems.

The objective is that the new methods can be applied by typical software developers who are working in web portal development. To accomplish that, the project will create and refine a training programme that can be used by an HCI expert for training developers in using the new usability engineering methods.

Finally, a main result of the project will be research training of two PhDs and one post-doc.

THE PROJECT'S METHODOLOGY AND RESULTS

The WPU Project will be based on a combination of state-of-the-art survey, method creation, method training and experimental assessment.

The state-of-the-art survey will collect experiences with usability issues in web portal development that are documented in the literature. The focus will be on the usability engineering activities that have been conducted, the problems that were faced and the solutions applied. We will also compile a list of method fragments that have been used to handle usability issues in web portal development.

The method creation will build the catalogue of methods that will be a key result of the project. This will include the experiences and the list of fragments of usability engineering methods that is compiled in the state-of-the-art survey. However, the main effort will focus on adaptation of existing methods and creation of new methods specifically directed towards web portal usability.

The method training will involve design of training programmes on the methods that are created in the project and use of these programmes in a participating company. The aim is to enable the developers in the company to apply the usability engineering methods in their development projects. The experiences with the training programmes will be documented and made available for others.

The experimental assessment will collect experience with the new methods for usability engineering in web portal development. The qualities of the methods will be assessed through a series of experiments, conducted in a participating software company and a laboratory setting. The assessments will be used to enhance the methods and provide guidelines for their use. The experiences with the methods and guidelines will be documented and made available for others.

The experimental assessment will involve three types of activities: laboratory experiments, action case studies and action research studies (cf. [2][3]). Laboratory experiments will be used to assess the qualities of specific methods created in the project. These experiments will be carried out in the Usability Laboratory at Department of Computer Science, AAU. The action case studies will be short-term assessments of individual methods when used in development projects in a participating company. The action research studies will be long-term assessments of a full series of iterative feedback cycles in a project in a participating company.

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Facilitating off- and online Learning in Networks

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ABSTRACT
Networks and private-public partnerships are in general viewed as important tools for innovation and knowledge creation and as means for knowledge dissemination (Castells, 2001). Bringing experiences, knowledge and methods together from diverse fields and sections, which normally are separated, foster new means for innovation of work practices and for the development of new services and products.
In this paper, we reflect on a private-public network on e-learning (NoEL), how to facilitate this kind of learning processes and what kind of technology support are productive.

Keywords
Networked learning, technology, collaboration, partnership, organization.

INTRODUCTION

The network for e-learning (NoEL - Netværk om e-læring) is a private-public-network in which 22 companies, educational institutions, libraries and two universities collaborate in order to develop and communicate their experiences and practice with e-learning. The companies both count bigger and smaller production companies as users of e-learning and software and media houses as producers and providers of e-learning. The network is running 18 months from February 2008 up to July 2009 and is funded by The Danish Agency for Science, Technology and Innovation and coordinated and administered by e-Learning Lab.

THE AIM
The aim of NoEL is to bridge the gap between business, research and education and to facilitate close contact with the researchers and their specific competence in e-learning. The network serves as a binding peer-to-peer network with a group of core businesses and institutions. These core participants are also co-financing the network (through man-hours put into the project). The aim is that NoEL will contribute to several companies and institutions taking e-learning in use, and that e-learning methods are developed and qualified. Further more, that research is related to practice and business needs. In that sense the network should provide a win-win situation for all participants.

ACTIVITIES
The Networking activities are multiple:

- In-person meetings in the form of seminars and workshops that provide the latest research in the field and as well appropriate and current problems in the practical experience of e-learning in businesses and education
- A digital collaborative environment in the form of a networking portal with opportunity for discussion, comments, announcements and download / upload files.
- Dissemination of contact between businesses, public institution and students from ICT education in connection with internships, project work, student job etc.
- Newsletters, reports and blogs that conveys the experience of research to the business community and vice versa

OFFLINE LEARNING & COMMUNICATION
The communication in NoEL is blended. We meet 6 times a year at seminars and workshops; these face-to-face meetings are an important basis for further discussions, cooperation and collaboration. Knowing each other and each other working conditions and continuously participating in the face-to-face activities on a regular basis create the foundation for a shared repertoire in the network as well as makes it easy to contact each other for help and bi/multi-lateral collaboration. The learning design in NoEL is build on a socio-cultural theoretical foundation (Vygotsky, 1978; Engeström, 1987, 1999, 2001; Wenger, 1998). Central in this understanding of learning is participation, engagement and meaning-making. According to Wenger learning is an integral part of the concrete participation and socialization into communities of practice and across communities. Learning takes place through negotiations, experiments, reflections and interactions between people, subject areas and tools. Wenger operates with the term *meaningful discourse* (Wenger 1998) as an effective communication phenomenon where learning occurs through dialogue. It is through meaningful negotiation, reflection and rethinking that skills, knowledge and identity are translated into new practices. Through the activity, debates and stories at the NoEL seminars the participants develop a shared

repertoire and a mutual commitment to contribute knowledge and experience into the practice of e-learning. The challenge is to continue to build up the shared repertoire and commitment in the online network.

ONLINE LEARNING & COMMUNICATION

Beyond the physical meetings the network participants communicate in a Moodle environment. The choice fell on Moodle because it is an open source LMS system, and because it supports the network's basic idea of collaboration, communication and learning in digital communities. It provides the opportunity to test the features we want to implement in a future knowledge web portal for e-learning, ex. sharing of files, news, discussions, the establishment of cooperative alliances, etc. for free.

In addition to describing the project, add news and resources, it is possible to subscribe to relevant blogs, wikis, and a common calendar as well. Further more, discussion forums can be created as needed.

In order to promote the network's activities to non-participants, the network also has a public website. It describes the network; you can download a leaflet with comprehensive network design, the project application, links to newsletters and seminars, as well as member and contact information. Here is located an alphabetical list of all network members. See www.noel.aau.dk

CHALLENGES IN RECONCILING ON- AND OFF LEARNING AND NETWORKING

We have described NoEL as a network of combined physical and online activities, with various forms of communication. The challenge is really getting the various forms to melt together. Until now, we have learned that there is most activity when it comes to physical seminars. There is a great attendance and commitment from participants. When it comes to online activity in the Moodle-environment the participants have good intentions, enrolling themselves, but are not really participating in discussions. In this way, Moodle become a kind of "storage place" where files, slides, programs, etc. are stored.

To ensure that all participants have news from Moodle all are automatically subscribed to receive them by e-mail. In this way, it is possible to receive news, without actively engaging in Moodle. The communication is becoming primarily a sender/receiver relationship between the network coordinator and network members. Although the system contains a large number of web 2.0 tools it seems to be a challenge to engage and involve the participants continuously between the seminars.

There is broad agreement among NoEL-participants on the importance of networking; there is also a broad agreement on the need for face-to-face meetings. In addition, a continuous contact and cooperation in a digital forum is demanded. However, it seems as a challenge to utilise the opportunities offered by Moodle and other online networking tools to support the network beyond storage, information and logistics about the face-to-face seminars. The question is very relevant as one output of the network is to build a web-portal to support information and knowledge sharing and networking. However, before we do so, we have to understand on a deeper level, what kind of network we are creating, and what kind of activities, resources and infrastructure is needed. In doing so we will look at two contribution to learning in networks: the concept of ‘networks of practice’ as suggested by Brown & Duguid (2000) and the concept of ‘technology stewarding’ in Networked Learning (Wenger et al., in press)

Brown & Duguid (2000) has proposed ‘network of practice’ to bridge the gap between networks and communities of practice in order to describe the relationships that are too broad and diffuse to be considered a community of practice. Brown and Duguid, characterize engineers in Silicon Valley as a network of practice - they share the interest in developing digital tools and services and meet at exhibitions, lectures, cafes, etc., but they belong to different companies, often in fierce competition with each other. Participants are dependent on each other in relation to getting the latest news, while they are in competition with each other. It is a sort of informal networks - and simultaneously plays formal networks an essential function and role in the more diffuse *network of practice* through meetings, newsletters, seminars, etc.. The participants know that they are mutually dependent on each other, but they do not share a mutual commitment to each other, in the broader sense. Furthermore, there is not a precise boundary to other groups, but just a network of fluid and dynamic borders.

TECHNOLOGY STEWARDING IN NETWORKED LEARNING

Technology is not a newborn phenomenon, but we need to focus not only on the perspective of technology, but also on the perspective of networkers. Networked learning technology enables a new learning agenda, which was not possible before. Trying to understand the relationship between communities and technology Wenger uses the term *Technology stewards* in a coming book: *”Technology stewards are people with enough experience of the workings of a community to understand its technology needs, and enough experience with or interest in technology to take leadership in addressing those needs. Stewarding typically includes selecting and configuring technology, as well as supporting its use in the practice of the community*.” (Wenger et al. in press)

Technology stewards are people in the community, who has taken the role of addressing how the technology can serve the community and who has a special interest in the

interactions between human and technology. The technology steward is not necessarily a top-down defined role, but often self-defined and emerged in the organization. Characteristic is that they are in-between more practices and trying to connect their practices by shaping technology and practice to each other. In Wengers concepts of *Communities of Practice* (CoP), they are attending a multi-membership of practices (Wenger 1998). Anne Marie Kanstrup (2005) also work with this relationship between technology and practice with her concept of local designers.

PROJECT NOEL

The network is well established with an ever entry of new participants and colleagues from the participating organizations. We have learned that partners in NoEL over a relatively short period have formed partnerships and collaborations. The good results is due to mainly two factors:

1. The blended network design
2. The network partners are represented both by research, public and private companies. We enter into cooperative relationships where we need each other's skills and knowledge

In a blended network where activities not only is reduced to some physical meetings, but also continuously is discussed and negotiated in a digital environment, the network becomes a part of daily business and a collaborator, easy-to-contact. In that sense NoEL is a network of practice (Brown & Duguid, 2000), the participants share the interest in developing e-learning and they are engaged to follow the latest news, and sharing experiences, but they really do not have a mutual commitment in their daily life. A prerequest for a network to succeed is commitment and accountability. All partners should gain more than they invest.

Several participants pass on NoEL activities in their own organizations, both as in-person meetings and through e-meetings, as some companies have offices worldwide. In that way knowledge is spread and the degree of participation broadened. Further more, there have been several examples of participation in the network has given access to other networks and international conferences and led to invitation of international and national researchers to debate in the Danish firms. Another example is a network participant, who through participation in the network had the courage to abandon his job as a teacher at a technical college, start his own company, where the first major job was for B & O, one of the major companies in the network. Now he is in negotiations with major international partners. He would never have had the courage to do so without NoEL, he says. Moreover, universities and companies are establishing partnerships in relation to research and development projects, and some of the participating libraries are applying for projects together and inviting the university as an action research partner.

So the different language and perspectives between research, business and education seems to have created a fertile ground for new activities.

DISCUSSIONS

What actually constitutes and represents a network? Although we claim that NoEL is a well-functioning network with many activities and a lot of learning taken place at different levels, we still have something to learn in relation to facilitating the ongoing online social networking. It seems obvious to us, that the activities cannot be limited to physical seminars and files stored in Moodle. Learning in networks requires aspects of human-human interaction mediated through digital technologies reconciled by the socially and physically networked nature of learning environments distributed over space and time.

We believe it is necessary to focus on networking, where activities are blended and composed of physical meetings, shared knowledge and social networking. In addition the role of technology stewards and local designers have to be legitimized and further developed in the network.

Our aim is to develop a network of practice where the relations and the social relations are realized in interactions between on-line and off-line networks. In doing so we believe we need to move from physical bounded communities to personalized (digital) networks.

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Understanding Relational Practices in UCD

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ABSTRACT
Relational aspects of UCD are largely overlooked in the literature. We use some recent criticism of UCD to facilitate a discussion of the how discourse, activities, and materials give shape to user involvement in design activities. Drawing on experiments with the workshop format for the conceiving of innovations and creative solutions with users, we introduce some criteria and points of interest in the development of a workshop format we tentatively call Vision Labs.

Keywords
UCD, User-Centred Design, workshop, critique, methods, methodology, innovation, relational aspects, socio-material practices

INTRODUCTION

This paper is an attempt, primarily in theoretical language, to investigate the pragmatics and background motivation fora method-in-progress we call Vision Lab workshops. We place this type of workshop within the widely dispersed field of User-Centred Design (UCD) since it involves users in the creation of ideas and inspirations that feed into a design process. This paper, and the inclination to work constructively with methods and techniques for user involvement, takesits outset in a *critique of the criticism* of UCD that has been proposed from various influential practitioners and researchers within the field of HCI (for example [1], [2], or [3]). One of the overriding issues that this criticism takes with UCD us the way in which the practice and the philosophy of UCD seemingly overemphasizes the importance and benefits of the direct participation of users in a design process. Direct user involvement and "asking users what they want", some critics argue, leads to conservative, unexciting, and often useless designs because users, unlike designers, have no expertise in understanding their "real" needs or real-life requirements and because they tend to have a limited technical knowledge and imagination in terms of coming up with innovative solutions. Such an argument is also implied in one of Jacob Nielsen's oft-quoted mottos that "users are not designers and designers are not users [4:12-13]. We propose that claiming, "users are conservative" or even "users are not designers" is the result of a specific *construction* of the user and claims merely *one* particular view on UCD that is too narrow. We believe that a critique of UCD should be *constructive* and not merely *dismissive* of the whole design philosophy of UCD – bringing users closer to the design process and using the users in a mutual, collaborative setting in order to not merely understand abstract models of use. By focussing on the relational aspect of UCD, by understanding how designers and users mutually shape the results of a user centred design process, we note how a reflective methodological stance can push the field of UCD forward.

The Vision Lab workshop is a format that we are currently working with in collaboration with industry partners, focussing on a study of relational aspects of UCD. For the empirical research, grounded analyses of two pilot workshops held with different participants, with different purposes, and in different settings, were conducted. A grounded empirical study of these cases examines how different kinds of user discourses, activities, and materials had an impact on the progression and result of the workshop. This was done to support our interest in understanding the relationships taking place in workshops as *co-constitutive* activities rather than the outcome of a specific set of, say, demographics of users with specific competences, specific ways of lacking, and specific idiosyncrasies. To some extent, the area of interest is similar in nature to what [13] treats as "design perspectives". The difference from their approach is mainly the way in which the issues presented here are themed around the constructive *artefacts* of the meeting between users and designers (an *artefactual design perspective*), not the horizon or mindset of the designer her or himself or the perspective that is consciously or un-consciously taken in a design project.

In a wider perspective, what the paper brings to the discussion correspond to assumptions and theories within both science and technology studies, some recent innovation studies, as well as the change in the recent technical, economic, and cultural drivers of user involvement in expressive, self-designing activities. These increasingly invalidate simple, formulaic propositions such as "the user is not a designer and the designer is not a user" is that sometimes, and arguably increasingly often, users

are indeed designers. The current focus on user-driven design (even if it, taken to its extreme, merely reverses the problem that we are discussing in this paper), as well as similar concepts such as design for "hackability" and the idea of appropriation of technology as qualitatively different from "adoption, shows a sensitivity towards the innovation potentials in everyday use. As the Finnish innovation researcher IllkaTuomi [10] argues, our culture has a tendency to construct narratives around major breakthroughs and innovations as if they were the work of one man(!), systematically overlooking the socio-technically embedded nature of creativity and disruptive ideas.

UCD AT A TURNING POINT

What UCD is about is of course a very volatile discussion. First and foremost, we will not begin to define in detail what UCD is since we find such a discussion inherently futile. Suffice to say that UCD is about, in one way or another, having users participate or be represented in a design process.

The criticism of UCD seems to echo what we believe is a spreading*UCD fatigue* that is gaining some momentum. It is as though the design community has grown weary of the old axioms of "listening to the user" and putting the user first. We are not actively defending the term UCD in this paper, although the connotations of the *user* rather than *use* might in itself prove important for any kind of activitieswith experiential implications, implications that lie beyond the effectiveness of tools. We do, however, argue that creative problems or innovative impasses do not reside in a design philosophy that entails having users participate in design efforts. Rather, we can approach such problems as problems that reside within the*metaphors and discourses* we use to describe the meeting between users and experts and the construction of the user as a specific asset in design.

Containers of Information

We have identified a central perspective in the budding UCD critique that points to a widespread conception of users in as "containers" of specific forms of competence. This conception of the role of the user in the design process has led to a strong, dismissive critique of UCD that questions the potential of engaging users directly in the design process. When Constantine speaks of the "conservative bias" of users engaged in a user-centred design process [1], we argue that this is employing a specific, tacit construction of "the user" and arguably of "user-centred design". This conception is also tacitly underlying the truism that "the user is not a designer and the designer is not a user"). This conception distinguishes sharply between who is what in a design activity, and inhibits an understanding of UCD as *relational* – as something that has a mutual direction. In Constantine's conception, users seem to have a kind of psychological propensity towards conservatism, a trait that echoes the construction of the user (or actors) in some recent innovation studies (e.g. [5]).

Of the more contentious assertions in Constantine's think piece, the three most prominent ones are arguably that "users are inherently conservative", "user inputs put the brakes on creativity" and "user-centred design might not be design at all" [1]. All three are, so we argue, problematic assumptions, not because they challenge what seems to, by now, be the relatively under-problematized way in which user-centred design has gained prominence within Interaction Design and HCI, but because they are based on certain assumptions about the relations between users and professional designers and the way in which input from users or the collaboration between users and designers can be used. Thus, for instance, Constantine argues that when asking, "whether users really need something, the answer tends to be yes, regardless of actual importance or demonstrable impact" ([1] 6.). Hence he concludes that engaging users directly in the design process is highly problematic, misleading and tending towards detracting from the designers potentials in creating inventive and innovative systems and solution for clients. Similar contentions with regards to user involvement as an inherently conservative practice are reiterated in for example [6]. While the answer to the above mentioned question might indeed be "yes" and while such a "yes" might indeed be inherently worthless and used anyway as a motivation for a certain direction in a design process, such an answer taken for granted in this way is only a symptom of a failed methodology or a misguided design philosophy if we choose to maintain a fully *naïve* understanding of what is happening when users meet with designers around a design project. It is useful to think of the problem as residing in what Agre[7] discusses the notion of "generative metaphors" inherent the various approaches to the human and technical sciences. Thus, for instance, if we consistently use a computational metaphor to describe the human mind and cybernetic metaphors to describe the human motor-cognitive system's ongoing relations to the world, we will miss out on opportunities to design for other aspects of the user – experience, enjoyment, satisfaction, and so on. In the case of Constantine's version of "naïve" UCD, the metaphor is perhaps not clearly *computational* but tends towards treating the subject of the design process (that is, the user) as something from which the designer can *draw out information* to support or discard her or his design decisions. The generative metaphor for the user becomes a "container of information", the generative character of the metaphor making it subsume activities according to that metaphor. Design activities come to be centred on attaining information *from* the user, specifying user requirements in a one-way monologic process: "tell

me what you need/want and we'll build it". A conception not dissimilar to this is present in Norman and Draper's definition of User-CentredDesign from 1986. They suggest that the user hasa great deal of power in the design project, and they write that "The needs of the users should *dominate* the design of the interface, and the needs of the interface should dominate the design of the rest of the system" [8](emphasis added).

Taking a rationalising point of view, the construction of the user as a container of information is logical since the ideal form of data from this perspective is unambiguous and requires no interpretation in order to be meaningful. Yet if we treat UCD as an interpretative practice – where the interviewer or the designer does notpretend to be a tape recorder [9]that merely *captures* what is said in a discussion – UCD becomes a wholly different thing.

Thus we agree with Constantine that if UCD *is* approached in a naïve way, *if* the users in a UCD processbecome merely containers of information that a researcher or practitioner can draw out by asking or probing, UCD will become useless and fail to deliver its promise of being centred on the person, on the human user, and arguably also extremely harmful to any kind of innovation or creativity. However, if we are to a provide a constructive critique of UCD, we argue that the focus should be on the method, the metaphors, activities, materials and other *performative*artefacts that are put to use within the method rather than the *user as an object* in her or his own right. The question should not be what the user can or cannot do or to what degree the user is able to "think out of the box", but how the framework around the user (the discourse, the activities, and the materials) gives rise to specific forms of data, to specific utterances, specific observations and interpretations. Thus, problems in putting UCD to use can be approached as related to the kinds of metaphorical or metonymic (that is, partial) descriptions we use to describe or understand the user.

WORKSHOPS

For initial observation purposes, we set up two different workshops that ran on very strict, pre-formatted scripts by the organizers. The primary intention with these workshops was to get an initial understanding of possible factors that should be thematized in further research. Both workshops were documented in photos and field research notes. Additionally, the first one was documented with video.

Workshop 1

In the first of the pilot workshops (with 24 Information Management students in four groups) we used the participants own fantasies and imaginations as starting points for new innovations and service concepts on a mobile digital device platform. The participants were initially prompted with images of state-of-the-art mobile services as well as an unstructured and open list of some possible conceptual areas. Phrases such as "handheld devices and therapy", "finding your way in life", and "e-banking on the street" were shown to the participants to stimulate their imagination and creativity. Throughout the workshop they were given a range different tasks with different materials to report in (clay, paper, individual scenarios – "how would YOU use the service?", discussions) culminating in a "pitch" exercise where the group leaders were to present the final idea in a brief stand-up pitch.

Workshop 2

In the second workshop (22 participants) with an industry partner within the field of mobile way finding services (mobilePeople), we designed activities around a strong notion of "partnering" when brainstorming for new innovations and concepts within the area of mobile marketing. Rather than attempting to stimulate the imagination of the developers, activities took place in small groups that included "regular", non-expert users and developers, marketing experts, and project leaders from the company. These groups were tasked with coming up with one idea for an innovative mobile service. The activities throughout the day were themed around "partnering" with the users, and some activities were implicitly designed to "tear down the wall" between expert and user. For example, users were encouraged to interview the experts, both on personal issues (e.g. "where would you like to travel right now"?) and on professional areas (e.g. when taking a down-town walk looking at public commercials: "what is good about that poster", "how does this translate to what mobilePeople does?" etc.).

Workshop Findings

We can in no way generalize the results from our analysis, but the findings will be used in the ongoing research and provide a better informed position from where other workshop formats and different constellations of user-relations will be tried out and analyzed. One researcher, using an open coding scheme and affinity diagrams, did the analysis of the two workshops.

Workshop 1 was done with non-expert, end-users exclusively. The primary goal for the activity was innovation in the field of advanced mobile services. Primary among our observations was that "wild" but also somewhat vague ideas that came up early in the process tended to get watered down towards the pitch phase. It seemed that there was an implicit wish in all the groups (working independently from each other) to come up with technically and socially *viable* designs that were immediately appealing to the audience. The concepts that the participants came up with suffered from the "conservative user" syndrome since they reiterated ideas and concepts that are currently being developed (such as mobile banking scenarios, mobile handsets as remote

control etc.). From an initial analysis we attribute this to the way in which individual exercises (a handwritten "personal story with new technology" task) and the "pitch" format shaped participants expectations of the outcome. The participants seemed to look for something that could be marketed. This was confirmed in the debriefing with the participants. The written "personal story", so we noticed, tended to be about the more conventional ideas that had surfaced in the brainstorm. This, so we argue, points to the way in which the written, individual report was biased towards relatively well-known technological territory.

Workshop 2 was deliberately designed a motif of mutuality between end-users and designers. Exercises in the workshop included users being invited to interview the professionals. Primary among our findings was that the partnering perspective offered the professionals a chance to reflect on their own practices (e.g. by being asked questions by the users). This created the opportunity for the practitioners to think outside the boundaries that they are normally confined to. The idea and concepts that were produced in the workshop fell well outside the normal business areas of the company, but stimulated discussion internally. In the workshop, however, the mutual relations faded somewhat throughout the sessions. We attribute this to a lack of strong articulationof the relation early on in the process. Many of the activities throughout the day sought to get a mutual process going, but a more manifest expression of the relation we sought to create could arguably have been a more optimal point of departure for the activities.

From the analysis of the workshops we have identified the three areas of interest that will be taken up in further research: The *user discourse*, how is the intended user articulated,*activities* such as prompting (i.e. the initial description of the activities for the workshop), individual vs. group work, changing roles (i.e. do the participants stay inside their initial roles or are the roles dynamic during the activities), and *materials*; how do the materials used shape the process? These areas will be central to the ongoing work with the Vision Labs.

- The *user discourse*: how is the user understood and articulated? Deciding from the outset what discourse and what associated metaphors should be used to describe the user can be a useful resource. Primarily, we believe that there is a profound difference between a construction of the user as a piece of information, an artifact, and a partner. Another possible distinction could simply be between *user* and *person*. In the design process, treating users merely as *users* provides different results than treating users as *persons* which implies a more contextual view on life-situation, needs, social factors, agency and so on.
- *Activities*: how are users involved in the activities, what role to the activities play? That is, designers should ask what kinds of relations and reports the various activities promote. The traditional interview can promote a relation that can be characterized in terms of "information in/information out". A successful user/expert collaborative workshop process tends towards co-creation of knowledge.
- *Materials*: what kinds of materials are provided for the different activities? How do they possibly influence the relations between participants and the way knowledge is treated? Using a phenomenological distinction between attending-to and attending-from, we can begin to discern what materials require direct awareness (this could be written reports during the workshop, for example the writing up of individual scenarios) and what materials enable other kinds of activities (for example sorting exercises that enable more collaborative efforts where cards or post-it notes becomes structures that enable discussion)

CONCLUSIONS

To sum up, we find that direct user participation in design efforts is still an ideal and a practice worth pursuing. The concept of user participation still has much to offer. However, UCD does seem to have overlooked the relational aspects of working with users in favour of treating users as "sources of information". This can also account for a UCD-fatigued practical design community where the adage of "listening to the users" has become a somewhat stale concept. We propose that it is possible, even beneficial, to reflect on how structures around direct user involvement give shape to outcomes and usefulness of interactions with users.In our further work on the method, we will begin to build the structure that will become the Vision-Lab workshop around the issues discussed above. We do not intend to provide a rigid structure or a script for holding Vision Lab workshops, but we expect the Vision Lab format to be a solid framework that highlights relations and continuities in the user/expert interactions.

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Evoking creativity: Young diabetics design their own mobile diabetes supporter

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ABSTRACT
This paper presents and discusses a method used to empower young diabetics as designers for future mobile diabetes technology. In a case study, conducted in the context of a diabetes youth camp, 24 young diabetics designed 12 prototypes to articulate their design expectations and ideas for mobile diabetes technology of the future. The study showed that in the described setting, young diabetics were highly engaged to take the role as innovators for future health technology. Furthermore, we argue that with this and other participatory design methods young diabetics can and should be involved in the development of future mobile ICT for their own selfmanagement. Young diabetic with their already existing experience in how to cope with their disease, their experience in using existing mobile and diabetes technology and their creative potentials, can have an important and fruitful contribution for the design process.

Keywords
Diabetes, participatory design, mobility, m-learning, children and adolescents

INTRODUCTION AND BACKGROUND

Diabetics have to deal with balancing a multitude of factors (e.g., regulating diet and exercise, monitoring metabolic control, treatment) to avoid short-term and long-term complications. They have to deal with their disease each and every day, their whole life long. Several factors, e.g. unknown quantities of physical activities, lack of information about carbohydrates in the food, planning how the next two or five will be, make this balance difficult for diabetics, and especially for younger ones.

While at home, the parents tend to take care of their children and guide them in becoming self-managers [5], outside their homes and even in schools awareness and responsibility for the diabetics is minimal [1].

In this research project, we explore how mobile technologies can assist type-1 diabetic children and adolescence in their actions and learning in relation to their disease in everyday life. Because cooperation (e.g., other family members, friends, other diabetics, health care specialists) is a central issue for this target group [5], we want to examine where and how mobile technology can facilitate and extend cooperation with existing or new cooperation partners as well as where and how this technology has to be designed to gradually help the diabetics release their dependency on cooperation with their parents. The objective of the project is to find and test concepts for mobile systems with a focus on the diabetics' perspective by applying participatory design methods.

This paper presents a method used to investigate how mobile technology should support young diabetics in everyday living from a user perspective.

YOUNG USERS AS DESIGN PARTNERS

Projects of the past years have shown the importance and success of involving children and adolescents as cooperators in design (e.g., [2]). Kids and teenagers can contribute with their imagination, visions, creativity and expectation in different phases of the design process of technology. Young users have a different understanding in how they see and understand the world and thus technology. For this reason, they cannot be considered as "small adults" [2]. Therefore appropriate participatory design methods have to be used to facilitate fruitful design settings.

While participatory design methods with young users establish slowly in the context of education and entertainment, we are far behind in the design of health technology for this user group. Take the example of diabetes, PD methods are mainly focusing on the involvement of clinicians or other health specialists [7], although they are aiming on the design for young diabetics. The target group, the young users, is traditional only involved in the last phase of the process: the software testing, and not from the beginning onward. Ethical issues have to be discussed with the involvement and empowerment of real patient in the design process. Nevertheless we view the diabetics not as patients, but as users and expert, whose interests and potentials should not be ignored. We argue that carefully planned settings are less critical, than excluding the target group from the design process and thus provoking new ethical issues [6].

If the design process is too much restricted, the risk is that we will not use the young users' potential in producing new ideas for innovative HCI. Inspired from the concept of

the solution space [3] invented by von Hippel, we took the following three aspects into account to facilitate a futuristic and non-constrictive setting for promoting innovative ideas:

Giving Small Hints to Evoke Innovation

From the methodological perspective, one goal of the design workshop is to provide a setting where young diabetics are motivated to articulate their ideas and visions about future diabetes technology. In order to evoke innovation solutions, the challenge is to find a position between two extremes. On the one hand, it is necessary to give users liberty to design as their creative potentials so wish, though this might hinder their ability to find focus. On the other hand, if they are given a lot of information and restrictions, this can lead help them into specific directions, yet it runs the risk of putting too many words in their mouths. Therefore, the choice of information for the design as their creative potentials so wish, though this might hinder their ability to find focus. On the other hand, if they are given a lot of information and restrictions, this can lead help them into specific directions, yet it runs the risk of putting too many words in their mouths. Therefore, the choice of information for the design task has to be considered carefully.

Do not Restrict Computation to Evoke Innovation

To encourage the creativity of young users, they were given no direct rules about how to create their mobile supporter, its functionality, its possibilities, or its look. With a narrative they should see themselves as the innovators of tomorrows technology. For the design of future technology, it is crucial not to restrict the mind with limitations, e.g. computational power.

Broaden the Understanding of Mobility to Evoke Innovation

Because the concept of mobility has changed and was expanded [4] within the last years, this should also be considered in the design process. The design process should rather grant the young users the freedom to express their needs and visions. They do this by letting them define the forms of functionalities rather than forcing them to use the functionality of specific mobile devices.

CASE STUDY

The goal of the case study was to find out how young diabetics want to be supported with ICT in their everyday living, especially outside their home. Furthermore, we wanted to investigate if the participatory design method is applicable in the very early phase of a design process of mobile systems.

The Youth Camp Setting

In this study, the setting of a youth camp was chosen to involve users in the design process. A diabetes youth camp is a supervised health program for young diabetics. The main goal is to improve their attitude towards diabetes in a setting that is more similar to everyday living than an alternative stay in a hospital. It is hoped that the experience will improve their motivation to continue learning how to self-manage their disease through informal learning, such as by seeking and by receiving guidance from health care specialists and sharing their experience with other diabetics. Additionally, the young diabetics have to participate in several learning activities, which consist of school-like lessons about diabetes and related topics (e.g., travelling, sport, insulin pumps, carbohydrate counting, cooking, blood glucose levels). Thus, the diabetes youth camp, with its variety of informal and formal learning practices, represents an ideal location for utilizing different methods during the early stage of the design phase (i.e. observation, interviews, workshops).

Workshop Setting

The workshop was conducted with young German diabetics attending a two-week youth camp for children and teenagers with type-1 diabetes. The three oldest diabetes groups of the youth camp took part in one-hour workshop sessions, i.e. middle girls group and oldest girls and boys group. In summary, 24 teenaged diabetics (ages 10 to 16) designed their own mobile diabetes supporter

Design Tasks

The task for the diabetic teenager was to design "their own mobile diabetes supporter" by focusing on one of four themes: 1) calculation/finding, 2) status/remembering, 3) sharing/cooperation and 4) learning about diabetes. The selection of the themes 1 to 3 was derived from the analysis with diabetic families [5], where six activities were identified. Since the formal learning aspect in a youth camp was central to the camps activities (mandatory for the diabetics to take part in certain lessons), the fourth theme “learning” was an additional selection.

To encourage the young users to consider themselves as innovators, they were given no additional rules about how to create their mobile supporter, its functionality, its possibilities, or its look. They were told that they are the designers of future diabetes technologies, regardless of what was possible today.

REALIZATION

The workshop was divided in two parts a) introduction and contextualization, b) design and discussion.

Part a) Introduction and Contextualization

In part a) the diabetics’ design preparation was to participate in two activities in order to create a context-awareness setting.

First, the diabetics were introduced to the four themes by using posters on the wall. The themes were presented with photos or images and additional questions (e.g. “How much insulin do I have to inject?”, “Did I remember to measure?”). Each diabetic had to glue ten colored stickers on the posters (see Fig. 1), stating which of these questions were most important for him/her. It was possible to vary the number of stickers for the questions.

Fig. 1: Participants gluing stickers on the theme posters.

Secondly, the concept of mobility and mobile devices was discussed in order to introduce the diabetics into various aspects concerning design of mobile technology. Therefore, a box labelled “my own mobile diabetes supporter” was used that contained different objects or functions, which could assist young diabetics become mobile (e.g. insulin pump, stopwatch, blood glucose meter, stuffed animal). The workshop supervisor asked for and presented known, already used and possible technology in the context of being mobile. The goal was not to limit the design of their mobile systems to those functions currently available in PDAs or mobile phones, but to give the young designers room for creativity.

Part b) Design/Discussion

The design part was introduced with the presentation of the four task sheets (Fig. 2) containing tasks and questions according to a specific theme.

You are in town and you want something to eat.
How should your mobile supporter assist you? What can it do for you? How should it look like? When would you use it?
Use the creativity kit to design your mobile supporter!

Fig. 2: Content noted on the task sheet for the theme “Finding/Calculation”

After the participants chose one theme, they received a toolkit, a "creativity pack", with different materials, i.e., Polaroid camera, 3D paper prototype of a PDA, a stuffed animal, modeling clay, glue, paper and pens, scissors, prepared stickers as well as blank stickers. Prepared stickers were printed with terms or symbols and related to diabetes issues (e.g., blood, insulin, food, activity, mood), possible cooperation partners (e.g., family members, friends, other diabetics, physicians), and technology features (e.g., GPS, SMS/MMS, Internet).

The decision to use prepared stickers came about as a result of a preliminary workshop with a group of diabetics. This trial showed that when the participants were given the ability and liberty to focus on everything, without being given any direction at all, their creativity was not stimulated.

The design activity took 30 minutes followed by a presentation and discussion of the results. This design activity as well as the discussion was audio recorded. Additionally, the design results were photographed.

RESULTS

During the three workshop sessions the diabetics designed 12 mobile supporters. For eight designed supporters the 3D paper prototype was used. In five cases, the teenagers used modelling clay either as primary design material or additional to the 3D paper prototype. None of the participant used the stuffed animal. One group defined their object only by gluing selected stickers on the paper prototype, whereas 11 of 12 groups added functionality and defined forms by writing individual notes on their supporters and/or by using and composing clay, paper and other material.

Fig. 3: Two participants design their mobile supporter.

The mobile supporters were varied in their styles and level of detail (Fig. 4). The designs ranged from collections of functionalities in brainstorming style (e.g. glued stickers on paper PDA) to detailed definitions of the interface (e.g., screen layout, buttons, and lights).

All results focused on the selected theme, although there was a strong wish (2/3 of the results) to integrate as much features as possible, e.g. learning prototypes contained functionality for measuring and injection, finding/calculation prototypes contained reminder functionality. One could argue that this was caused by the prepared stickers contained in the creativity kit and the fact that the participants were free in the choice of what and how much to choose. Nevertheless, the wish for multi-functionality highlight that there is a need to support different aspects in their disease and that it is difficult to rank them because everything is interwoven and therefore calls for an ambient design of ICT [5]. For the further

design process it could be useful to let the participants prioritize the functions and consequently get discussions on priorities and not just 'nice to haves' but reflections on 'need to have'.

During the design activity, the participants put themselves in futuristic setting where there were no limitations in technology: A girl explaining a designed mobile supporter: "There should be a camera in the phone. If I do not know how much carbohydrates are in the food, I want to take a photo of it and then it should show me how much carbohydrates are in the food."[1] Another girl presenting the features of their mobile device: "… And we put many question marks on it. If there is an emergency and we don't know what to do, we want to ask the computer what to do …" The workshop supervisor asks if the computer should answer the questions or if they would use the computer to communicate with somebody else to get an answer on the question. Girl: "The computer should answer these questions; that is what it is there for after all."

Fig. 4: Left: prototype with stickers. Center: 3D paper prototype with GUI and components (e.g., tube for insulin pump). Right: jewelry that alerts parents with lighted LED about low blood glucose values.

The motivation to participate in the workshop was different from group to group. While the youngest girls group (10 to 13) was very enthusiastic from the beginning to be put in the role of the designer and to use the different materials (especially the 3D prototype of the PDA), some of the boys group had to be motivated. One of the boys was scoffing about the modeling clay and noted that he had no ideas how to solve the task. Yet, after he observed others occupied with gluing stickers on the prototype, he became very engaged in designing his own device and searched for additional material to model the tube of an insulin pump, the lancet and other equipment. Surprisingly, the big girls group (ages 12 to 15) was very enthusiastic in using the modelling clay and discussing their design results.

[1] Diabetics have to know what is in the food especially the carbohydrates to be able calculate their insulin dose.

LESSONS LEARNED AND NEXT STEPS

The young diabetics were empowered and considered themselves as innovators for future technology and designed on an imaginary journey, visionary and future solutions from their perspective by reflecting their dreams in how technology should support their everyday living.

The selected material promoted a way to direct their thoughts, but not restrict their imagination. The users could choose the way of expression and articulation they preferred for the design.

The participants were motivated and engaged, at the very latest after seeing their peers actively participating in designing their supporters. Their engagement can be seen in their resulting design supporters: all dealing with issues concerning the disease and their selected themes.

The major challenge in using this method is to bridge the gab between visionary ideas of the users and possible implementations for the designer. The workshops setting enabled the production of a futuristic scenery with technology solving all the problems of young diabetics. Back to reality of the 21st century, with existing limitation in computational power, interface design, as well as in project budget, the designer has to take into account the possible transformation of diabetics design into designers design. The further analysis of the result and a re-involving of young diabetics in the design process can show to what extend it is possible to transform users ideas into real design.

This method can tell us about how young users understand technology and their disease and how they dream about being supported by mobile technology.

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User Centered Development of Dyslæs – a Reading Training Tool for Dyslexics

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ABSTRACT
This paper presents the User Centered Design (UCD) and overall design- and usability evaluation results of a reading training system for dyslexics employing automatic speech recognition (ASR) and multi modal presentation techniques as core components. Based on an analysis of dyslexic reading behaviour as well as and extended UCD process involving actual dyslexic test subjects it is shown that current ASR performance suffices for dealing with dyslexic input to an automated training system when the special phenomena present in dyslexic speech are taken into account. Finally, explicit design guidelines for such a system are derived experimentally aiming at assuring a high level of perceived usability when used by dyslexic users.

Keywords
Dyslexia, multi modality, ASR, WOZ

INTRODUCTION

Dyslexia is one of a number of known language disorders that deteriorates reading skills. Dyslexia literally affects millions of citizens all over the world. In Denmark it is estimated that 2-5% [1] of the population has significant difficulties in reading and writing primarily due to dyslexia. As functioning in modern society heavily relies on the capabilities of text processing, dyslexia constitutes a problem of increasing magnitude.

While assistive technologies such as screen readers can aid dyslexics in their everyday life these also burden the users with the demand for carrying around special devices and applying them when having to decipher textual information.

Training, which increases the dyslexics' readings skills to read on their own, is a resource demanding task that requires skilled personnel and time. It is therefore desirable if this training, or part of it, can be transferred into an automated supplementary training tool that can be used by dyslexics on their own.

As many traditional training techniques basically rely on spoken interaction between a dyslexic user and a therapist, this solution calls for the deployment of ASR technology.

Despite significant improvements within the area of spoken language technology, most technological developments for dyslexics have so far been constituted by relatively simple combinations of off-the-shelf language technology products and existing tools (e.g. combining regular word processing software with commercial speech-recognition or -synthesis systems, [2]). While such a solution may be applicable for dictation purposes this is not necessarily the case for training purposes as it does not take into account the highly irregular way dyslexics typically read (i.e. heavy usage of filler words, abnormal pausing, restarts, etc.) and the full potential of speech technology is not reached. A dedicated recognition scheme targeted explicitly towards usage by dyslexics seems needed in order to obtain optimal performance when trying to establish an automated variant of reading training for dyslexics. Research in dedication of speech recognition towards dyslexic users has previously shown that such explicit targeting of an ASR system is possible, [3].

This paper presents the iterative design process as well as the experimental results of combining Danish speech recognition dedicated towards usage by dyslexics with traditional pedagogical approaches, into an automated reading training tool, [4]. The dyslexic target group is constituted by Danish adults suffering from developmental dyslexia.

TRAINING SCHEME

Through interviews with speech therapists working with dyslexics on a daily basis, it was concluded that the widely used pedagogic technique "Book and Tape" [5] illustrated in **Error! Reference source not found.** is applicable as a pedagogical approach in the prototype system.

Using this technique dyslexics listen to text-segments being read out aloud (i.e. using a tape recorder) while simultaneously reading the same text from a book. After this, the pupil reads out the same text-segment aloud and progresses to a new segment of text. Parallel to this, a speech therapist listens and corrects any errors and evaluates the performance.

Our purpose is to transfer this technique into an automated solution in which the performance evaluation is handled via ASR and assistance is provided via multimodal presentation techniques (i.e. adapting to the principle of multiple sensory channel stimulation).

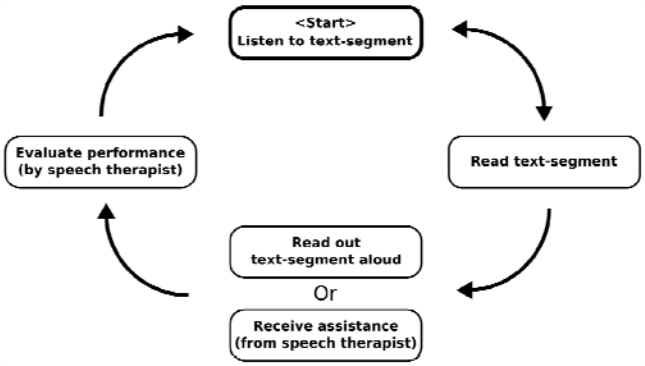

Figure 1: Outline of the 'Book and Tape' training technique.

Figure 2 shows the 24 steps in the UCD process as iterations in the spiral model. Four phases - *definition, design, implementation and test* defines the activities – such as "field trial" (*test phase*) or "analysis of dyslexic reading behaviour" (*definition phase*). Prototyping has been used extensively in the development – from a conceptual prototype in the first iteration to a final, fully operational prototype in the fourth iteration.

User Centred Design

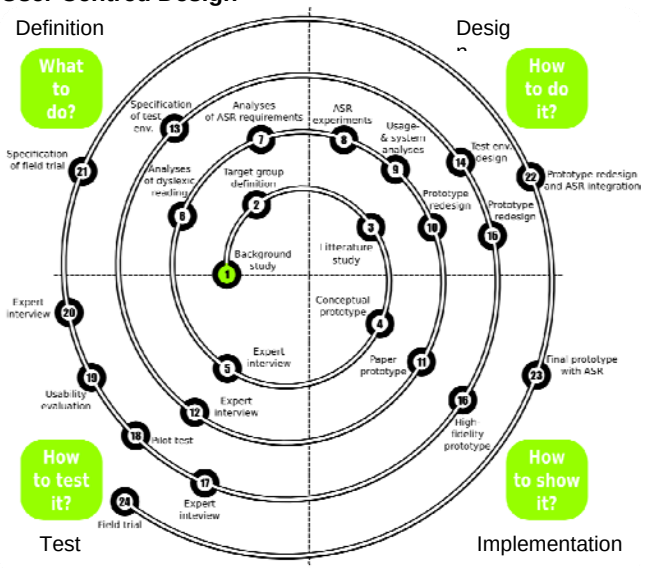

Figure 1 The UCD approach applied for "Dyslæs" comprised 24 steps, split into Definition, Design, Implementation and Test phases.

In the First iteration, the "Book and Tape" scheme is adapted into an automated ASR-based system as outlined in Figure 2.

The tasks handled by a speech therapist are now handled automatically via ASR and (multimodal) assistance. In the following iterations, the design of schemes for **feedback**, **assistance** and **evaluation** (steps **b**, **d** and **e** in Figure 2 respectively) are proposed and evaluated.

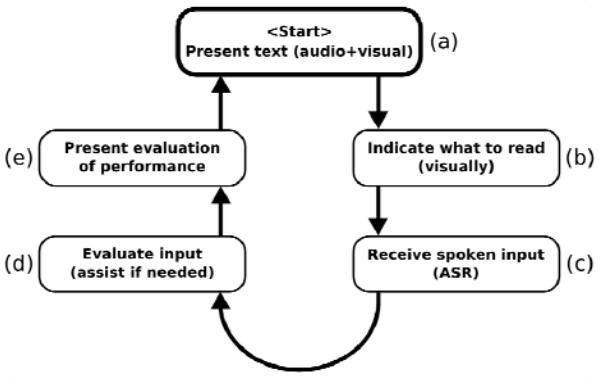

Figure 2 Automated version of the 'Book and Tape' technique.

Feedback

The purpose of the feedback functionality is to act as a progress indicator to the user, allowing him/her to see what has been read so far, and whether or not this was correctly read. Two overall feedback issues are evaluated: format and timing i.e. *how* and *when* to provide feedback.

Format

Words read out correctly by the user need to be marked as such. This marking can be done in a number of ways. Six different formats are investigated: striking out text, font reduction, text removal, text graying, text re-coloring and text underlining.

Timing

The feedback can be provided using one of two timing schemes. It can be presented at '**word level**' meaning that while the user reads out words this is reflected, word by word in the interface, as discussed above. Feedback also be presented at a '**sentence level**' meaning that all feedback is provided successive to the readout of sentences or other blocks of text.

In a similar manner, the design and user preferences regarding **Assistance** (how the system provides help, e.g. by reading a difficult word), and **Evaluation** (how the system summarises and presents the reader's performance for a whole session and compares it to previous sessions) are determined. A detailed account of this can be seen in[-46 -].

DYSLEXIC READING CHARACTERISTICS

The reading behaviour of the target group was initially (definition phase) investigated by analyses of recorded reading sessions. These were carried out in a controlled environment by eight subjects - ranging from 'mildly' to 'severely' dyslexic (as classified by a professional speech therapist).

In total this has resulted in approximately 100 minutes of recorded speech (including intra-word "silence"). Introducing an extended version of the SpeechDat transcription standard [6] as a multi level transcription

approach in which traditional orthographic annotations are combined with annotations of errors, intended words and timing events (i.e. regressions and progressions) these recordings have been manually annotated and analysed.

Reading Characteristics

Based on analyses of the recorded speech corpus, the following characteristics are descriptive for dyslexics:

- Frequent regression/progression.
- Frequent abnormal intra/inter word pausing.
- Frequent filled pauses (e.g. 'eh..' and 'ehm..').
- Positive correlation between word length and misreading frequency.
- Frequent correct beginnings of misread words.
- Variable voice level – the level is often lowered noticeably before encountering difficult words.

A series of ASR experiments, using the Sphinx IV open source speech recognition engine [7], have been carried out using the recordings of the target group as training input, [8]. The focus has primarily been on reducing the amount of False Rejections (when the ASR falsely rejects a word that has been correctly read), as this error type is considered highly de-motivating. The ASR performance obtained from the field trial is shown in table 1 below.

Utterance	ASR %
Correct read	CA: 77.4 FR: 8.2 FAR: 10.1
Incorrect read	CR: 8.3 FA: 6.0 MDR: 52.0

CA = Correct Accepted. CR = Correct Rejected
FR = False Rejected FA = False Accepted
FAR = False Alarm Rate = $FR_{correct}/(FR_{correct}+CA_{correct})$
MDR = Miscue Detection Rate = $CR_{incorr}/(FA_{incorr}+CR_{incorr})$

Table 1. ASR performance in the field trial.

Out of all correctly read words 77% are correctly recognized and 8% of these are falsely rejected (FR).

For what concerns incorrectly read words, only 52% of these are identified as being wrong (MDR)

GRAPHICAL DESIGN

As described earlier, a number of prototypes have been used in the development. The version illustrated in **Figure 3** has been developed and used for the field trial in the fourth iteration.

Figure 3 Screenshot from the prototype tool. Colour is used to indicate correct, incorrect and unread text.

The user wears a headset and controls the speech recogniser by pressing a "Record" button in the GUI. 25 individual interaction and GUI issues have been investigated and implemented in the final prototype. This is elaborated in 4 For example, the feedback format and minimalistic design are results of this process, as well as the assistance scheme, where users can click on individual words to have them read aloud.

The test issues have been evaluated in a semi-balanced manner (within-subjects approach, n=16) in a quiet environment including only a test operator and a single test subject at a time.

TEST RESULTS

In general, all 16 subjects were quite pleased with the prototype tool and the potential of facilitating self-training by this. Only a single subject felt strange about 'talking to a computer' and requesting help from this while the remaining subjects all felt comfortable doing this (none of the subjects were aware of the WOZ setup). As shown in **Figure 4** relatively heavy usage of the assistance functionalities occurred during the test.

Subjective user preferences were captured via post-test oral interviews (boldfaced options represent results of statistical significance):

Feedback

Word-level feedback was preferred as timing strategy for receiving feedback, and most subjects preferred the **re-colouring of text** as feedback format.

For what concerns the timing of the feedback, the word-level preference appeared to be more distinct for the more severely dyslexic subjects.

Assistance

The multiple-initiation assistance scheme was preferred by most subjects, and when providing assistance this should preferably be done using **pre-recorded speech** as assistance format.

For what concerns the timing of the assistance, the automatic schemes ('automatic' and 'multiple-initiation') appeared to be preferred by the more severely dyslexic subjects.

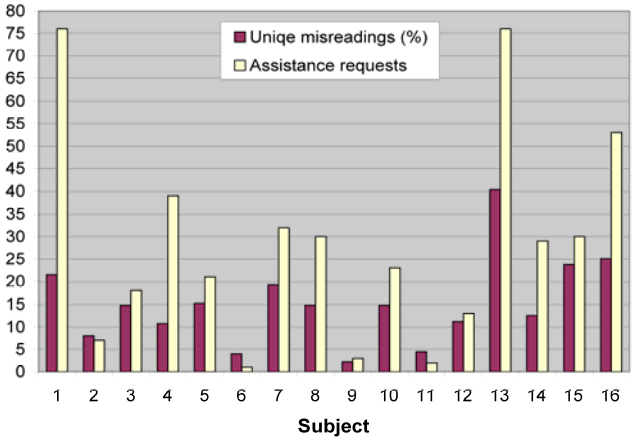

Figure 4. Misreadings and assistance requests during the test.

Evaluation

Most subjects preferred the **successive evaluation** scheme, and preferred furthermore to be presented with a numerical outline of their performance. As one subject put it "..this evaluation form allows me to easily compare with previous scores..".

DISCUSSION

None of the subjects complained about difficulties using the system and in fact all were able to complete the tests without the help of the expirementor. Even though the ASR performance can be improved, the current level seems to be acceptable to the users.

CONCLUSIONS AND FUTURE WORK

We conclude that current state-of-the-art ASR technology can be used as a core component within an automated reading training system for dyslexics.

Interactive behaviour of both the ASR component and the user is likely to be affected by practical conditions such as precision and sensitivity of the speech detection, recognition delay and sensitivity to environmental noise. More usability evaluations are therefore needed in order to determine if an actual integration of ASR into the automated training system will have an impact on the perceived usability.

Finally, while the evaluation results indicate that dyslexics are capable and prepared to accept using an automated reading training system this does not necessarily mean that they will actually benefit from this in terms of reading proficiency in a longer term. This question can only be determined through an extensive longitudinal trial, where the dyslexic readers are monitored and evaluated over a period of time, when using the tool. This is currently being planned.

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Designing for inclusiveness – immersive workshops as gathering data tool

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ABSTRACT
This paper presents a brief description of four workshops designed as part of the research "Inclusive Informatics School for Blind Students". The workshops were designed with double objectives, as an introduction for the process of inclusion of blind students in Informatics Schools and as tool for gathering data for the research. In this paper we will discuss them from the point of view of the second objective. The workshops were conducted in Universidad Nacional (UNA) in Costa Rica with the participation of teachers from Informatics School, with blind students from UNA and teachers from other careers with previous experiences with blind students. The workshops provided valuable information to construct data for the global research.

Keywords
Inclusiveness, identity, belonging, blindness, inclusion, Social Theory of Learning.

INTRODUCTION

The overall aim of the PhD project Inclusive Informatics School for Blind Students is to develop a framework of inclusiveness for learning in universities, particularly for blind students.

Building on social theories of learning and learning in communities of practice [7], this project views inclusiveness as closely related to identity formation

> Because learning transform who we are and what we can do, it is an experience of identity. It is not just an accumulation of skills and information, but a process of becoming – to become a certain person or, conversely, to avoid becoming a certain person. [7]

Taking as a point of departure this reflection from Wenger, the inclusiveness process in the School of Informatics is not only a process of providing the right skills and information and to overcome the difficulties for blind students, but a more comprehensive challenge related to the issue of identity and the negotiation of new identities. In this sense, it is necessary to understand the elements that affect learning and how is altered by blindness.

Our main interest will be to understand the practice and the identities that can support or hinder, cope or block, encourage or discourage the learning process, the belonging and the inclusion.

Inspired by the model of "Two main axes of relevant traditions" [7], an inclusive educational environment can be presented as in Figure 1. Then, it represents the tensions between the social structure (law[2], discourses, culture, history related to blindness) and the practice of situated experience (coping with learning practice) and the horizontal axis between theories of practice (inclusiveness practice) and theories of identity (identity, formation, tools appropriation) [7].

This study focuses on the axis dealing with the practice of inclusiveness and the identity of students. The social structures and situated experiences are discussed indirectly as interacting in the realization of the practice of inclusiveness and identity formation.

METHODS TO UNDERSTAND PRACTICE OF INCLUSIVENESS

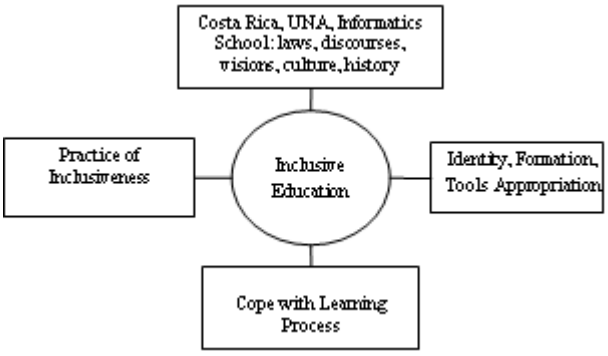

Figure 1. Two main axes for inclusive education in UNA.

The project use two main approaches, in-depth ethnographic inspired interviews with blind students [6], and immersive and design workshops in a Costa Rican context. In this paper, especially we are going to discuss the workshops as means to learn about and to design for inclusiveness.

THE WORKSHOP IN A GLANCE

Complementary to the semi-structured interviews, a set of four workshops were design with double objectives:

1. to design a workshop methodology to introduce the inclusive process into the Escuela de Informática (Informatics School - IS), in Universidad Nacional – UNA in Costa Rica, and

2. to develop a tool to collect data about blindness with teachers from the IS, teachers from other careers having experiences with teaching blind students, and with blind students of UNA. The presentation and discussion will focus on the second objective.

The workshops as tool to construct data

The four workshops were sequentially depending, with different sets of participants in each one. The four groups of participants were:

1. The Students group, conformed by four blind students from different careers of UNA, different than informatics.
2. IS-Teachers, consisting of seven teachers from the IS.
3. Experienced-Teachers, consisting of teachers from UNA with previous experiences with blind students.
4. The office of disabilities affairs of UNA (UNA Educación de Calidad para Todos – UNA-ECT).

The workshops were designed with inspirations from an ethnographical approach [3, 4]. The objective was to provide IS-teachers with some experiences about being blind, and to get insights into the lived experiences from blind students, furthermore to use these experiences as point of departure to formulate principles for designing for an inclusive Informatics School.

Viviendo entre penumbras y sombras

(Living among sombreness and shadows) The workshop was designed as an introduction to the blindness and its impact in the academic life in order to get the participants involved in the theme, with some real life experiences. The participants were only IS-teachers. It started with a personal presentation and a briefly description of their motivation for participating in the workshops. Then, participants were blindfolded to experience the blindness in simple and ordinary activities in the daily life and in the academia. Then, the curriculum of System Engineering of

IS was used to inspire the partici-pants in thinking of possible difficulties that blind students may face enrolled in this curriculum. Also, they were asked to classify their findings with respect of:

- Advantages blind students may have.
- Difficulties with solution.
- Difficulties with high cost solutions.
- Solutions with value added to all students due to pedagogy improvements.
- Difficulties with no solution.

Related with the social structure, we wanted to learn the perception of UNA teachers about blindness; what was their attitude towards dealing with a blind student in classroom, and their preconceptions about the possibilities of success of these students. Also to learn from their own perspective, how should be the academic adaptations, and the process to belong to the classroom and to the university community[1].

Along this workshop, we tried to discover obstacles, barriers, stigmas, discriminations, ignorance that can affect the proper integration of blind students into the university community.

Also, we wanted to explore how the teachers see their own practice and how it will fit into the necessities of blind students, identifying the breakdowns, the tools that they think will be necessary and the ones that are missing.

Aprendiendo con otra percepción

In "Learning with another perception" workshop, the four groups were invited to participate. After a self presentation, participants formed working groups, considering having one blind student in each group. Each group should make a list of accessibility requirements based on the experiences of the students and related with infrastructure, tools, human resource support and material resources.

Each group worked inspired in one of these areas and they were intended to understand the relevance of the requirements, with a final discussing about the most relevant aspects they found. Along this activity, we wanted to incorporate new concepts about inclusion and accessibility, from the life experiences of the students and from teachers with previous experiences, with the intention to open a space where newcomers continue the

[1] As university community we are referring to the group of teachers, students, support staff, and any other that have influences, participation, interaction into the process of learning into the university context. It is looser concept than community of practice, because we are not expecting that it achieve all conditions to be a community of practice. This not means either that it is not possible that some university communities can constitute a community of practice.

reflection process started in the first workshop, now enriched by the interventions of the students.

In the second part of the activity, we asked the groups to reflect on these questions: "Is it possible for a blind student to study System Engineering? Why? What do we need to do?" Groups were provided with the material generated in the first workshop related with the findings about problems and difficulties. They had the task of validate the difficulties and its respective classification, and revoke or confirm teacher perceptions, as another way to negotiate the meaning of the real difficulties. A final conclusion was made with the audience.

The workshop was planned to provide a space where the participants could discuss their own experiences. This process allowed identifying maybe not the tools that the inclusiveness practice should require for fulfill the necessities of a System Engineering student, but the tools that this practice is using in other careers in UNA, and also the tools that are not necessary because were established from false assumptions.

From the discussion of what is a problem or a difficulty and what is not, was possible to construct data about the tools that the students are using to overcome the situations that teachers mentioned from their perspective. Some of these tools belonged to the practice but others belonged exclusively to the students and their adaptation to the learning environment.

As a natural consequence, if the audience was validating thoughts, experiences and feelings with life experiences of students, it could be possible to add some other elements from the social structures, depicting gaps between discourses, culture and inclusion processes.

Related with identity, we expected to identify facts that could be affecting students identities, the influence of their membership or multi-membership, their trajectories, their negotiability within and with other communities, and how they perceived their opportunities to succeed. As the students were validating their reality regards teachers perception, some information about their own identity could be recognized [7].

Taller visionario: Soñando con el futuro.

"Future workshop: Dreaming with the future" was prepared inspired as a future workshop[1, 5] with the participation of only the students.

The preparation phase[1, 5], sets the scenario for taking the students in a journey of dreaming about tools and solutions. They were invited to participate in a workshop where they would have the opportunity to dream and share with other fellows about how they could have a better environment for learning at the university. Also, the previous workshop could work as inspiration.

The critique phase was called "Pintando mi realidad" ("Drawing my reality") and students were requested to bring to the session a list of difficulties that they have had to face regards of:

- Coping with the class room, regular academic activities, examinations, etc.
- Working in groups, labs, workshops.
- Coping with the academic and pedagogical environments.
- Using Tools.
- Any other academic activities.

The list has to be sorted to highlight the three most significant difficulties for each student which should be presented to the rest of the group.

In the request should be necessary to insist on not construct new difficulties, neither to include awful situations that may happen or happened rarely. Instead they should keep focus to enlist those difficulties that they faced daily in the academic environment, those that without being terrible situations constitute a little stone in their shoe.

It was essential to try to keep the motivation high in order to have group prepared to dream. Therefore, it was important to define "the 'critique phase' as the 'problem-finding phase'" [1], but it should not mean to be sunk in problems.

"A soñar…" ("Let us go to dream…") was the name of the fantasy phase. Here, the students were invited to reflect about their dreams to support them in the academia. Using the list of the first phases as an inspiration, they should think about solutions or tools for these difficulties, without any limitation with respect of availability, cost or feasibility. Even though the goal of the activity is to focus on solutions for the academic environment, no limits should be imposed in any deviation of their dreams. We wanted to register any dream they could have as a reflection about their needs, probably even undetected as such by them.

This was the most important activity in the whole set of workshops and one of the most difficult activities as well [1].

The last phase was designed to bring the solutions to the reality and was called "Dando pasos firmes ¿Qué es posible desarrollar?" ("Stepping on firmly. What is possible to develop?")

In this phase, we wanted to bring them back to their own construction of the world, to understand their own reality and how it is built. We wanted to see the students selecting the most relevant dream, or how much hopeful they were to find solutions to the situations that motivated them to enlist that specific dream. It could be difficult to separate these two possibilities, related with a single dream, but either case, both conclusions are very interesting.

From their perception about experiences and ideals, should be possible to construct their priorities, and from their wishes, should be possible to build their necessities. How these necessities influence their life? Also, we will be looking for something particular that may be significant for their identities, their membership or multi-membership, their trajectories, their negotiability within and with other communities and experiences.

It should provide some reification of practices as well.

Taller de profundización: Obteniendo soluciones

(Deepening workshop: Getting solutions). The last workshop was designed to join participant teachers from both groups, as a way to negotiate their reification of the blindness, the inclusiveness and the supportive tools, as well as a step to organize the concepts discussed to be prepared for a future formal process to develop policies, infrastructure, materials, tools, training, adjustments, adaptations; in summary, everything necessary to achieve reasonable levels of inclusion in the short-term.

The first activity was the presentation of the experienced teacher, talking about his experiences as teacher of a blind student, and about the methodological adjustments he did in his classes and evaluations and if these changes provided pedagogical improvements for the other students in the classroom.

The second activity was called "Aprendiendo del aprendiz - reflexión sobre lo aprendido" ("Learning from the learner – a reflection about the learned"). In this section, the results of the three previous workshops were presented and were used as a motivation to discuss things of the interest of the audience. It was an open space to explore the doubts, interests, worries, concerns, lessons learned, reflections, possible situations that could be specific for students in IS that are not present in other schools, the real opportunities that blind students have to succeed in this career.

The main objective of this workshop was to provide a space where teachers could reify their practice into a new one, which starts considering the concept of inclusiveness. From the point of view of the process, it provided information of their priorities and their feelings of the areas with higher difficulties.

Also, it interesting to understand how the process of negotiability of meanings and practices is, and how easy social structures can be readapted by themselves to provoke a real change in their own perception about blindness

FINDINGS

The workshops showed to be an efficient source of information to construct valid data, optimizing the short time available for the activity. Also, they allowed to us to observed a dynamic process of negotiation of meanings, that was rich not only in the process but in the final results. It was quite interesting to experience the fast moving of teachers in the inclusiveness process just within a few hours of workshop, experiencing the blindfold by themselves and through the students and enriched by the experiences of other teachers. In summary, this is an activity that deserves to be done, not only for gathering data, but to cooperate with the inclusiveness process.

PLANS FOR FURTHER RESEARCH

The analysis in depth of the workshops is the next challenge. Due the nature of the activity and the multiple dialogues along the workshops, we will need to base our analysis in the videos and recordings and in the material generated by the participants. The philosophical orientation will be toward phenomenological analysis with an hermeneutical approach to consolidate the data from all the sources[6].

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We want to thanks to Informatics School of UNA for the unconditional logistic support received in the realization of these workshops and to the teachers from IS and to Mr. Mario Carazo of UNA for their active participation, as well to the students, since without their participation the workshops would be meaningless. Also thanks to the office UNA Educación de Calidad para Todos for their counseling in the realization of the workshops.

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Evaluation Framework for Mobile Rich Media Services

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ABSTRACT

This document describes the PhD study entitled Rich media services on mobile devices: evaluation and optimization of usability and end user experience conducted jointly by Motorola A/S and Aalborg University. The study aims at designing, implementing and assessing an evaluation framework dedicated to the usability and end user experience with mobile rich media services, such as mobile TV or multimedia content sharing. Two main activities will be carried out in parallel during the study: definition of mobile rich media services and evaluation of these. The former activity aims at answering the question "What are the services customers will use on their mobile devices?" while the latter focuses on "How to evaluate those new types of services?"

Keywords

Study plan, user experience evaluation, mobile services

INTRODUCTION

Out of the 2.5 billion worldwide mobile subscribers, only a few million used mobile TV in 2006 [20]. The mobile TV market is still in its emerging phase yet it demonstrates a huge growth potential for the near future. Although today most mobile TV consumers are located in Eastern Asia (mostly Japan and South Korea), market analysts such as Rethink Research Associates or RNCOS estimate that Western Europe is expected to gradually take the lead in revenues from the global entertainment mobile market by 2011.

As defined in [19], the mobile TV value chain involves various actors from mobile device manufacturers to network providers and payment agents. All contribute to the end user experience either by supplying a handheld platform supporting the technologies concerned, a broadcasting format or some content to be consumed.

The work introduced in this document takes place in the context of the Converged Advanced Mobile Media Platform (CAMMP) project which aims at building "*a proof of concept service infrastructure on top of the converging technologies*." One of the project's R&D objectives is to "*identify and evaluate new types of personal, mobile services that go beyond existing TV and radio combining traditional push broadcast with user generated audiovisual content and shared immersive experience*."

In this document, the "State-of-the-Art" section introduces the areas that either are directly covered by the study or otherwise influences or bounds it. Then the section "Research Questions, Hypothesis and Methodology" introduces three of the main research questions the study will answer, and for each of them, the starting hypothesis and the foreseen methods employed to answer it are presented. Furthermore, "The Evaluation Framework" which will be implemented is introduced together with the related areas investigated during the study. Finally, the "Conclusion" summarizes the work achieved so far and presents the coming next steps.

STATE-OF-THE-ART

In this section, the review on mobile broadcast introduces the technological basis of the study. Then, the review on mobile video/TV illustrates the need to identify key issues in order to understand the end user experience. Finally the study's primary focus is introduces through a selection of hot research topics.

Mobile broadcast

The European Commission recently decided in June 2007 to support DVB-H (Digital Video Broadcast for Handhelds) as the recommended broadcasting technology for European countries [4]. As a descendant of the DVB-T standard (where T stands for Terrestrial), DVB-H adds features to receive digital television on mobile handheld devices, described in [5, 13]. The two documents also provide results from extensive performance measurements conducted in laboratories, which demonstrate the standard's efficiency, especially in terms of error correction and power saving.

Although DVB-H is mainly present in Europe, it has also been launched in other parts of the world, where it competes with three main other standards: Digital Media Broadcasting (DMB) which is mainly used in South Korea and can operate either via satellite (S-DMB) or terrestrial

(T-DMB) transmission; 1seg which operates mainly in Japan and Brazil; and MediaFlo™, the proprietary format from Qualcomm® which is mainly used in the United States.

Mobile video/TV

Consuming video when on the move implies various factors related to the surrounding environment, such as the context of use or the location's network capability. Therefore it is vital to understand the users' habits and needs prior to developing mobile TV services. It is also equally important to understand the technology involved and the challenges it introduces to anticipate how it will influence the end-user experience with the service. These two lines of research are illustrated in the two following paragraphs.

As stated in [16, 19] users have very different needs regarding mobile TV content and interaction when on the move from when watching TV at home. These studies' findings emphasize that mobile TV is principally consumed outside the home environment to manage solitude, disengage from others, manage transition between places or juggle commitments. It also appears that people tend to use mobile TV services at home, in order to coordinate TV content with the family or simply to combine TV consumption with other factors such as devices sharing or need for togetherness. In a Norwegian study of Mobile-TV users' behavior, the authors of [1] confirm that home is the privileged place to use mobile TV through a study.

A parallel line of research covers more technical domains related to mobile TV, including the imaging issues related to the use of a small screen. For instance, the authors of [10, 11, 12] derive requirements from case studies for mobile TV interfaces with regards to image resolution, bandwidth and user interaction. The main issue in terms of image resolution concerns the level of image details offered to users, especially with textual information associated with a very popular content like news. However, a smaller resolution does not automatically result in a worse user experience: although users express their wish for the highest image quality possible, these studies demonstrated that users tend to accept more easily low bandwidth when associated with a small resolution. Concerning the interaction with a software interface, users demonstrated recurrent wishes such as using TV guides, the possibility to suspend the content played and to have access to live content.

Usability and end user experience evaluation

When it comes to evaluating an electronic consumer product, numerous empirical studies conducted by industrial and educational institutions illustrate the strong impact of usability on the degree of service acceptance by end users. For instance, the extensive bibliography used in [3] provides a valuable source of information regarding methodologies and setups used to evaluate various aspects of mobile usability. These cover issues from design guidelines for handheld applications [2] to comparison between laboratory and field testing of mobile applications [8].

The authors of [14] emphasize three key areas to take into consideration: usability, experience and functionality. While the latter is clearly a technical issue, the definitions of usability and experience appear more confusing. It is today generally accepted that usability is strongly related to the user experience, if not part of it [15]. Indeed, usability is often defined as a combination of various factors. For instance in [6], the authors develop the four ideas of *ease to learn*, *usefulness*, *ease to use* and *pleasantness to use* while the author of [18] introduces the "5Es" (*Effective*, *Efficient*, *Engaging*, *Error tolerant*, *Easy to learn*). Those definitions illustrate the close relation between usability and user experience and the possible confusion about the concepts they cover. As a result of this confusion, current discussions try to state a clear definition of user experience and its relation to usability.

Finally, the field of mobile usability evaluation is animated by an interesting discussion on the benefits of field trials over experiments conducted in laboratory. Numerous studies have compared both approaches [7, 8, 9] and have agreed that if field trials provide more reliable output due to the realistic environment surrounding the test users, the actual gain of the field trial method is difficult to quantify, especially when rated against additional parameters such as costs or practical issues. For instance, [7] describes and assesses an implemented framework to evaluate the mobile and ubiquitous user experience 'in the wild' during large test campaigns. Both methods present advantages depending on the experiment's focus and its expected outcome: while studies focusing on software applications might benefit from the test framework discussed in [7], grip studies might gain more via studies similar to the one presented in [9]. Concerning grip studies, the study presented in [17] demonstrated that the hand position variation when people hold a mobile phone has a strong impact on the signal absorption. This indicates that the user experience may be decreased simply by the way users hold their mobile device.

RESEARCH QUESTIONS, HYPOTHESIS AND METHODOLOGY

This section presents the lines of research identified at the beginning of the study as the main directions to investigate. Those directions might however be adapted later on according to the study's findings, the project orientation or the relevance of the research.

QUESTION 1: *How will subscribers use mobile rich media / TV services?*

Hypothesis: most users will consume mobile TV for short durations between activities or while transiting from a place to another. Thus the content provided should be formatted for short watching duration (news/sport summaries); offering easy hopping, pause/resuming.

Methodology: literature review, in-the-wild surveys, use studies in a controlled environment.

QUESTION 2: *What is the best methodology (trade off between reliability, repeatability, speed, unobtrusiveness) to evaluate the usability of rich media services on mobile devices?*

Hypothesis: "in the wild" experiments present numerous advantages as it implies real environment, but suffers from poor user experience assessment methods.

Methodology: usability lab, framework for user experience evaluation, comparison between in-the-wild and controlled environments.

QUESTION 3: *How does the user interface (device form factor and Graphical User Interface) influence the user experience with rich media services on mobile devices?*

Hypothesis: the service's GUI and navigation model can influence the way users hold the device, thus preventing his/her hand to affect the reception quality. Additionally, an adapted form factor can improve the user experience with a device by implicitly forcing the user to hold the device in a manner optimized for watching video content.

Methodology: literature review, usability experiments in a controlled environment (simulated reality in user experience lab).

THE EVALUATION FRAMEWORK

This section describes the concrete issues that will be investigated during the study through the design and implementation of an evaluation framework. Some of its requirements are stated, examples of applications illustrate its envisioned use to deal with concrete metrics, and the three main elements which compose the framework are exposed.

Requirements

REPEATABILITY: the intention is to apply the framework to various combinations of devices and features to evaluate. The framework should therefore be based on standardized tools and methods that are easily adaptable to different test environments. Moreover, developing solutions offering a wide application choice increases the possibilities for assessing it while being developed.

SPEED: additionally, the framework should propose solutions that are fast to use and process. As they will involve real users, the test sessions need to be executed in a timely manner as they imply direct and indirect costs. Such costs include paying the test participants and facilitators for the time spent, possible use of equipment (internal or external).

FEASIBILITY: finally, the framework should use reliable tools which demonstrated high capabilities, yet being implemented at a reasonable cost. For that reason, the first versions of the framework will be based on existing solutions in order to evaluate them and assess their efficiency. Later, when results from research will demonstrate relevance and efficiency, associated methods and tools will be concretely implemented.

Metrics

The evaluation framework will be built, tested and utilized in the perspective of the CAMMP project. Therefore, applications of the framework will be aligned with the project's goals and status. Two main categories of metrics will be considered: usability and user experience. While the former deals with how users interact with the service, the later investigates why do they use it. Foreseen usability metrics are *ease of navigating through the electronic service guide*, *readability of textual information embedded in video* or *speed to access specific content*. Similarly, foreseen user experience metrics are *comfort of use while watching video*, *importance of audio on perceived quality of service*, or *impact of context on content selection*.

Elements

ENVIRONMENT: the first question the study will address is *where* the selected feature should be evaluated. The main issue to tackle with that regard is whether to carry the experiment in a controlled environment or in the wild. Both setups will be assessed depending on the metrics to be evaluated. For instance, it is commonly accepted in the literature that the former is more suitable to track and discover usability issues while the later suits better the investigation of context-related issues and end-user experience. This statement will be verified through the implementation of use cases and test scenarios.

METHODS: the second line of research will address the question of *how* usability and user experience metrics should be evaluated. First, a list of metrics associated with the CAMMP issues will be identified, extending the preliminary list presented in the list mentioned previously. Then, adequate methods will be assessed against those metrics according to various factors such as ease of integration into the framework or *cost of implementation*.

TOOLS: In the same manner as for the environment and methods, this third line of research will try to answer the question of *with what* tools the identified metrics should be recorded and the collected data be processed after the experiment. The identified tools will be rated according to their *reliability*, *speed* and *robustness*. Tools include recording material, such as cameras or accelerometers, as

well as 3D rendering solutions such as POSER™, and data processing tools such as MATLAB™.

CONCLUSION AND FUTURE WORK

This document presented the main lines of a PhD study aiming at assessing and improving methods and tools dedicated to evaluate the usability and end user experience with mobile rich media services. The context of the study as well as a succinct state-of-the-art in the field have been presented, from which research questions have been formulated. Then, concrete directions for the study have been identified, providing examples of concrete areas to be investigated.

One of the next steps of the study will be to identify and validate methods and tools to capture how users hold a phone when interacting with rich media services running on a handheld device. This grip study will support the design of both an intuitive and pleasant Graphical User Interface for such service and an effective antenna to receive the broadcast content with limited loss due to the hand absorption.

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Evaluating Mobile and Ubiquitous Applications in the Field by Automated Capture and Analysis of Reality Traces

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ABSTRACT
New methods and tools are needed to face the challenges of evaluating the user experience of mobile and ubiquitous applications. The paper discusses reality traces as the results from capturing information about the interaction with such applications and the context in which it occurs. Automated capture can be done by utilizing the sensing and processing power of personal mobile devices and be used to conduct remote and autonomous field evaluations in realistic settings. The paper presents RECON and GREATDANE, which are two concrete tools developed for respectively capturing and analyzing such reality traces.

Keywords
Mobile, ubiquitous, user experience, interaction, context, reality traces, data capture, data analysis, method, tools.

INTRODUCTION

Innovative mobile applications are emerging powered by advances in technology and computing paradigms such as ubiquitous, pervasive and context-aware computing. Interacting with such applications often entails a more complex user experience that requires special attention when evaluating it.

While UX is generally used as shorthand for user experience, this paper will use the term µX (MUX) to refer specifically to the Mobile and Ubiquitous user eXperience. µX can be defined as "*the user experience arising from systems, services and applications with which the interaction is essentially mobile and ubiquitous*" [14].

Mobility should be attributed both to the device and the user [9], and together with the situatedness it gives rise to complex and unpredictable contexts of use which will directly or indirectly influence the user's experience.

Evaluating µX

A central discussion concerns whether to evaluate applications in the laboratory or in the field. Intuitively, µX should be studied in-situ under realistic conditions, yet this is not the predominant approach [16]. Arguments against field studies are that that data collection is difficult, costly and that such experiments lack control of the contextual parameters. Some claim that it is not worth the hassle [17, 15] and others that it is [19].

Some key problems with existing methods are:

- The obtrusiveness to the user experience as they rely on the user to actively report data or observers to be physically present.
- The time, manpower and resources needed to design, set up and conduct the experiments are high.
- They do not scale well with the number of users, duration of study, and geographic area in which they can be conducted.
- The lack of capability to study long term usage and/or interaction in context properly.

The purpose of this paper is to discuss remote and autonomous field evaluations as a new approach for evaluating µX applications that address the abovementioned problems.

Paper Outline

Section 2 will introduce the concept of reality traces and discuss the importance of context. Section 3 will discuss how field studies for gathering such data can be facilitated through automated capture and analysis of reality traces and Section 4 and 5 will present two concrete tools for doing this. Section 6 will discuss pros and cons of doing this type of studies.

REALITY TRACES

Reality traces are datasets describing the users' interaction with an application and the context in which it occurred. Essentially it is detailed log files augmented with contextual information about the particular situations.

Interaction Data

Interaction can be considered at various levels of abstraction. From low level UI events like button presses to higher level actions, activities and sessions. To get a detailed picture of the user experience it might be necessary to consider all of these levels. Reality traces should contain all information of relevance in the later analysis.

Context

Context is very important to µX and thus also a critical factor to consider when evaluating it. A frequently cited

definition for context within context-aware computing is given by Dey:

> *"Context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves." [4]*

The notion of relevancy is not very clear and also the above definition is for context-aware systems, i.e. systems that *"…uses context to provide relevant information and/or services to the user, where relevancy depends on the user's task"* [4]. When discussing evaluation of µX the following definition is proposed instead, which is essentially based on the above but emphasizes the user experience and the situatedness:

> *"Context is the sum of relevant factors that characterize the situation of a user and a system, where relevancy implies that these factors have significant impact on the user's experience when interacting with that system in that situation."*

This definition is arguably still prone to the critique of Dourish, who points out that treating context like a representational problem is not realistic since it is not a static concept that can be neatly captured, modeled and represented [5]. Due to the dynamic nature of context a factor may be relevant in one instant of time and irrelevant the next, just as the significance to the user experience may change depending on the situation.

When talking about capturing context for creating reality traces, it thus refers to capturing information about these factors; while acknowledging that it will never be complete and it will be up to the individual evaluators to specify which are of relevance for their specific studies.

REMOTE AND AUTONOMOUS FIELD EVALUATION

Figure 1 shows a conceptual diagram of how such field evaluations can be conducted in an unobtrusive way. Capturing software is installed on a mobile device together with the given application. The users in the experiment will interact with the application in their natural environments for a period while the evaluator is spatially and temporally remote. Reality traces are automatically captured and reported to a central server where they can be analyzed and reviewed by the evaluator during the study. Some experiment control is possible through remote configuration of the capturing software.

RECON

RECON (made up of Remote and CONtext) is a tool for capturing application specific interactions, general usage of the device and a wide range of contextual factors of the device, e.g. available networks, GSM towers and signal strength, Bluetooth devices within proximity, battery status, etc. [18].

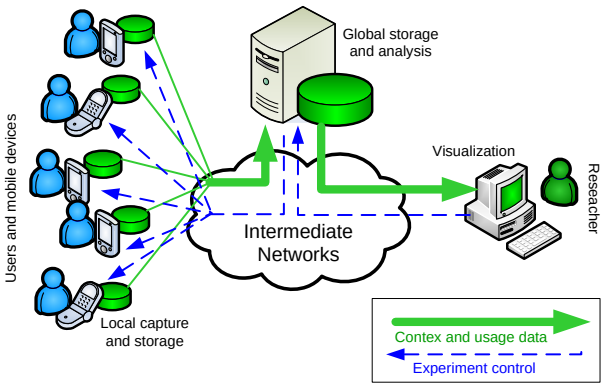

Figure 1: Remote and Automated Evaluation

Figure 2 shows the client-server architecture of RECON. Interaction data is captured through code instrumentation of the application being evaluated. Relevant user and system actions are sent from the application to the RECON client, where they are logged together with the context data in a local database. The context is captured through the sensors and information processes available on the device. The reality traces are kept in local storage on the device until preset conditions are reached and it can be uploaded to a central RECON server. Configurations are updated through the server e.g. the logging policy.

Existing work

Log files is an old and widely used technique, but only few other systems exists for capturing context from the mobile personal devices. The following have all been used in field studies: ContextPhone [21] used in [6] and [20], MyExperience [8] used in [2] and SocioXensor [11] used in [12]. Some have made external sensing devices, which require the user to carry and extra device [1]. RECON is mostly comparable to MyExperience and SocioXensor as they have similar functionalities and run on the same platform (Windows Mobile 5.0 or newer).

The main difference is in how they are set up and deployed and the fact that RECON is especially tuned to capturing detailed interaction data from an application together with context. If needed, RECON can also be used for general usage and/or context capture and it supports prompting the user with small questionnaires.

GREATDANE

GREATDANE (Generic REAlity Traces Data ANalysis Engine) is, as implied by the name, a generic tool for analyzing the data contained in a captured set of reality traces. In essence, the goal is to transform these traces into meaningful concepts and metrics from which the user experience can be evaluated. As datasets quickly become large when sampling the context of use, it is very desirable to automate the processing of these. Thus automation is important to ensure scalability with regard to duration and number of users.

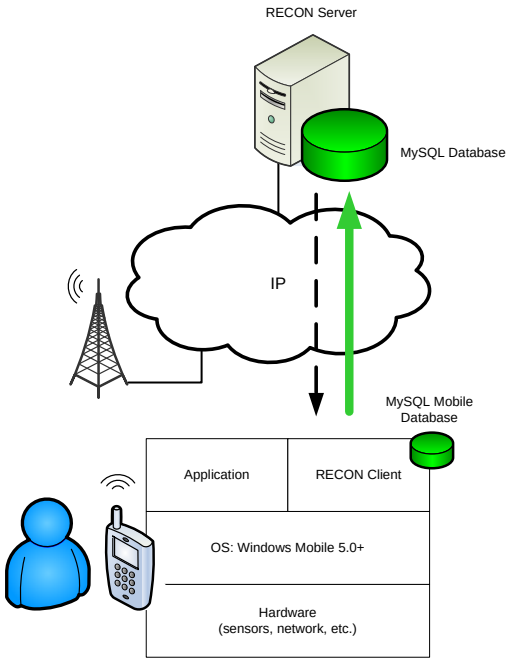

Figure 2: RECON

The analysis builds on a sequential event-based model wherein interaction is treated as a sequence of events categorized as either user actions, system actions or contextual events. The analysis engine uses a predefined model of the application to abstract low-level events and actions into higher level concepts, e.g. sessions, activities, actions. Information about frequency of use, duration, success and error rates and other metrics are calculated at each level.

The approach can in many ways be compared to LSA (Lag Sequential Analysis) as used in [3] and is also inspired by Exploratory Sequential Data Analysis [7]. Hilbert and Redmiles surveyed a range of existing methods for extracting usability information from user interface events [10], but none of the tools and methods there applies directly to µX.

First experiences with GREATDANE were from the DiasNet Mobile field evaluation. Results from the longitudinal field study of DiasNet Mobile can be found in [13].

GREATDANE is designed to be a generic tool independent of the way in which the reality traces are captured. Thus ContextPhone, MyExprience, SocioXensor or any other capturing tool could be utilized to obtain the dataset. It is very important to address the representational problem of reality traces and how it can be synthesized with many users, many contexts, heterogeneous platforms, sensors, etc. If a rich, flexible and uniform representation format of such data was developed and agreed upon, it would enable sharing of datasets and pave the way for generic analysis and data visualization tools.

DISCUSSION

The following lists some of the main pros and cons in doing this kind of experiments:

Pros

- Unobtrusive, ideally the user will forget that he/she is in a test situation
- Real tasks, not some scripted scenarios
- Real context, the situations in which the usage will occur is realistic
- Scalability both with regard to area of study, number of users and duration of study
- No need for external sensors

Cons

- Lack of direct control during the experiment
- Noise and uncertainties in the data
- Worst case the users will not use it at all
- Need a working prototype – robust enough for deployment without too much maintenance
- Privacy, security and ethical issues

The objective nature of reality traces can be complimented by qualitative data collected with other methods such as interviews, surveys, etc. One method that fits well with the autonomous field evaluation approach is experience sampling. Which RECON already supports.

CONCLUSIONS

New methods are needed to evaluate the mobile and ubiquitous user experience, especially for investigating long term usage and interaction in context. The paper introduced the concept of reality traces and discussed how such data can be captured unobtrusively in remote and autonomous field evaluations using tools such as RECON and GREATDANE for automated capture and analysis.

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Living Lab Skagen 2008

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ABSTRACT
This paper presents ongoing work on development and experiments in a Living Laboratory for ict health services in the city of Skagen in Denmark. First, the paper presents a general description and definition of Living Laboratories followed by a definition used for Living Lab Skagen. Second, Living Lab Skagen 2008 is presented with recent experiments and lessons learned.

Keywords
Living Lab, ict health services, diabetes, user-driven innovation.

INTRODUCTION

Working with design of human-computer interaction (hci) in naturalistic living environments allows for a better understanding of how to design information and communication technology (ict) with respect to the complexity of real use practices. Since the 1990s ict has moved from the personal computers desktop to mobile and pervasive technologies and services [4]. This increase in the complexity of use situations adds further challenges to facilities supporting analysis, prototyping, and evaluations of interaction designs. Living Laboratories have come up as one recent answer to these challenges. Living Labs focus on experimenting with ict in (semi) naturalistic environments in co-operation with a variety of participants provided by a constructed infrastructure supporting ict applications for the lab.

This paper presents ongoing work on development and experiments in a Living Lab for ict health services supporting the everyday life with a cronic disease. The living lab is situated in the city of Skagen in Denmark – a city with a shared focus on health services supported by the joint community 'The Foundation Skagen Health'. The point of departure for Living Lab Skagen is services related to diabetes – a chronic disease which is increasing and have a complexity of relevance to other/related chronic diseases.

The paper presents a general description and definition of the concept of Living Laboratory followed by a definition of Living Lab Skagen. Second, Living Lab Skagen 2008 is presented with recent experiments and lessons learned.

LIVING LAB DIFINITIONS

Følstad [5] presents an updated literature review on Living Labs and deliver in this process the following definition:

"Living Labs are environments for innovation and development where users are exposed to new ICT solutions in (semi)realistic contexts, as part of medium- or long-term studies targeting evaluation of new ICT solutions and discovery of innovation opportunities" [5, p. 116].

As presented by Følstad Living Labs have existed in the ict literature since the 1990s and can roughly be divided into three types of laboratories with different scale and focus:

- *Living Labs to experience and experiment with ubiquitous computing:*

  Living Labs for the studies of ubicomp established at several research institutions where some of the well known are GorgiaTech [1] and MIT [6]. These Living Labs are typically small scale – including a small number of users in experiments.

- *Living Labs as open innovation platforms:*

  European Living Labs described as "functional regions where stakeholders have formed a Public-Private-Partnership (PPP) of forms, public agencies, universities, institutes and people, all collaborating for creation, prototyping, validating and testing of new services, products and systems in real-life context" [3]. There are more than 50 European living labs, e.g. i-City in Hasselt and Leuven in Belgium, i2Cat in Barcelona Spain, the Helsinki Living Lab in Finland – for further references see [2]. These Living Labs are all large scale – up to 6.500 users.

- *Living Labs exposing test bed applications to users:*

  In ict test beds applications are exposed to users, e.g. wireless services to be tried out by users in a controlled network environment. Test beds often focus on developing a mobile/wireless e-infrastructure to integrate technology component to the complex everyday life of people. As such test beds are not just for testing technology: "benefits or usefulness for people in everyday life must be proven before technology or services can be said to be a success" [9]. [5] notes that several of the European Living Labs

seem to be employed as facilities to expose users to test bed applications. Test bed living labs are typically large scale.

Common to Living Labs is the purpose of medium- or long-term cooperation with users understood as data collection across one week or more [5]. The common ambition is to study evolving patterns of ict use for understanding and predicting future use patterns in society and communities.

LIVING LAB SKAGEN – A DEFINITION

Living Lab Skagen aims to establish a platform for user-driven innovation. Innovation is understood as an interactive learning process between users, researchers, software consultants and business providers [10]. User-drive is defined as engaging users in early design processes for pointing out directions for design [8; 11].

Living Lab Skagen has a focus on digital health services for everyday life support of people with or in contact with chronic diseases. Diabetes is the case and everyday diabetes management is understood as a collaborative activity and consequently related to the whole family and not just the individual diabetic [7]. This focus is visualized in figure one.

The ambition is that experiments with ict services in Living Lab Skagen will bring forward knowledge on how to support everyday life activities of people with or in contact with diabetes with ict. The overall aim is to increase quality of life, inclusiveness, collaboration between participants in society and not least support the work of health care professionals. Consequently, participants in Living Lab Skagen are diabetics and their families, ict-developers, shops and business interests, and researchers within the field of interaction design and health informatics collaborating on the development of Living Lab Skagen.

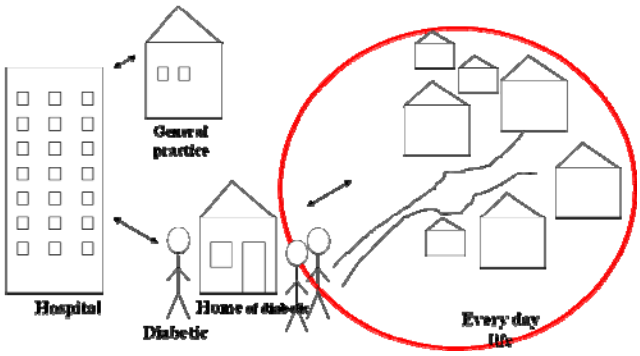

Figure 1: The Focus of Living Lab Skagen.

Defined, Living Lab Skagen is an open innovation platform aiming at creating a real world environment for collaboration between firms, public agencies, Universities, Institutes and people cooperating on analysis, prototyping and validation of ict-services in real life context.

LIVING LAB SKAGEN 2008

The outset of Living Lab Skagen – Living Lab Skagen 2008, is small scale with eight participating families/30 users, two service providers/shops, researchers from three departments at Aalborg University, ict-consultants from The Danish Technological Institute and Edvantage Group, and representatives from the Foundation of Skagen Health.

The experiments in Living Lab Skagen 2008 were based on context knowledge (in contrast to widespread technology driven Living Labs, cf. [5]) based on

1. Home interviews with users in December 2007 and January 2008.
2. Post-card diaries from users in the period December 2007 to March 2008.
3. Workshop at the University with users in March 2008.

Analysis of these activities resulted in an understanding of six core activities related to diabetes in everyday life, two types of information related to diabetes, two types of location support, and two types of life-world perspectives [7]. This context knowledge was discussed and elaborated at a workshop and conceptualized into a constructed low-tech infrastructure with three days experiments taking place across two weekends in September 2008.

Central conclusions taken into experiments were:

- Location based and activity based activities: Experiments with location based activities (focusing on supporting information to the right person at the right time at the right place) and activity based activities (focusing on supporting information to anyone, anywhere, anytime). How ambient and how personal does information need to be in order to support everyday management of diabetes?
- Calculation vs. simulation management: Experiment with supporting informed guessing (simulation) rather than precise calculation. How precise does information need to be in order to support everyday management of diabetes?

Methodologically focus was on

- Staging future use situations in natural environments.
- Evoking users' innovative potential.

The program for the Living Lab Skagen 2008 was:

1. Friday evening: Welcome at Skagen Tourist Office
2. Saturday morning: shopping at a butcher's shop
3. Saturday midday: lunch at family cottages
4. Saturday afternoon: workshop followed by a walk
5. Saturday evening: dinner at a restaurant
6. Sunday morning: design workshop and evaluation

Location based experiments: calculation-support at a butcher's shop and at a restaurant

Two experiments were carried out on location based services – one at a butcher's shop and one at a restaurant. Both locations were selected by the users as difficult places to get access to information on food. Focus was generally to experiment with the quality of getting access to hidden information at the location, the quality of the information, and the form for e-information at public locations. Information on selected food at the butcher's shop and on the menu at the restaurant was provided via RFID-tags and USB-readers displayed on screens set up on location. The shops provided information and location for the experiments. Ict-consultants introduced the technology to the users. Users experimented – buying lunch and ordering dinner. Researchers conducted interviews with users after the experiments.

Figure 2: Users experimenting with location based services at a butcher's shop.

Activity based experiments: simulation-support in everyday life activities

Two experiments were carried out on activity based services both using a mock-up designed for and installed on a small (10' screen) computer. The purpose was to design mobile services. However, the mock-up of the user interface was too rich for small screen design. Consequently, small laptops were used instead.

The mock-up focused on simulating consequences for the blood sugar level in relation to food, insulin and the physical activity of the diabetic. A laptop with the mock-up was provided to all diabetics and one for their family to share. Users were instructed to use the mock-up at lunch and before a planned walk and used it also at their own initiative several times during the weekend. Ict-consultants introduced the technology. Researchers conducted interviews and design workshops with users focusing primarily on the quality of simulation and the quality of the information.

Figure 3: Users at a design workshop where post-its were tacked to the laptop with notes on their ideas for a mock-up.

Workshops

After two days in the living laboratory users were ready for innovation. Their solution space had been broadened by trying out different technologies and their comments on mock-ups had been heard in several interviews and discussions – they were ready to think forward and focus on where to go next. At a final design workshop users designed, in groups of families, their future ict tool using pen, paper, modeling clay, paper pc's, etc.

Figure 4: Users designing their future diabetes ict tool.

Maxi games

To support collaboration, team spirit and nice atmosphere minor social events was planned for the Living Lab Skagen 2008: a Living Lab song and a Living Lab walk with a quiz. The song was used at the introduction Friday evening and at the restaurant Saturday night. The quiz was part of the walk Saturday afternoon and a winner was found Saturday night at the restaurant.

Evaluation

The final activity in Living Lab Skagen 2008 was an evaluation. Users were interviewed about their experience from participating and their ideas for further development and improvements of the user-innovation process. Business providers were interviewed – the butcher's shop, the restaurant, and the representative from the Foundation

Skagen Health, on their experiences on and ideas for further lab activities in Skagen Living Lab.

FIRST HAND LESSONS FROM SKAGEN 2008

Analysis and evaluation of Living Lab Skagen 2008 is still in progress and will provide knowledge on ict design to support everyday life of diabetics and knowledge on user innovation management which will form a basis for Living Lab Skagen 2009.

At this point the following first hand lessons learned on the construction and practicing at Living Lab Skagen 2008 can be listed as followed:

- Living Lab Skagen is a Living Lab constructed in real world environment, however not an everyday environment to users, researchers or ict-consultants. We travelled to Living Lab Skagen and this journey turned out to be fruitful. Compared to interviews, diaries and workshop users participated 100% in Living Lab Skagen. It was clear that we had entered a laboratory where we were to play everyday life, however without everyday life interfering. The amount of hours spend in a Living Lab is not so important. If participants are ready and focused from a pre-process and participating seriously you will get (too) much data from six days.
- The social events turned out to be important. Users requested more social events. To the users 'get to know each other' was equal important as experimenting and innovating. This recalls the importance of remembering that users off course participate because they hope to be able to influence technological development but also because of the experience it will be. Living Lab should be fun to engage in – Living Lab managers must remember the importance of breaks and games.
- The more co-operators, the more applications, the more experiments… the more living. The three mock-ups in Living Lab Skagen 2008 provided a large and solid data material for further development and experiments. However, in order to experience a more living laboratory a critical mass – between 5-10 services, is the goal for Living Lab Skagen 2009.
- A Living laboratory is a constructed infrastructure which provides a safe zone for interaction designers, enterprises, and users to experiment with how the world could be. Consequently, designing, operating, supporting and evaluating a Living Lab calls for an open interest in the complexity of everyday life situations – an open interest in the outcome we did not expect, the breakdowns, the contradictions and other surprises. If you have this interest, Living Labs can be recommended.

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Design workshops and the development of UNAgora

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ABSTRACT
In this paper, we describe a group of workshops that were developed with the goal to establish a meaningful dialogue among university teachers and researchers. This process of mutual reflection enabled a deeper understanding of teacher's experiences, feelings, achievements and difficulties lived by them during the eight months of their participation in the community UNAgora. Furthermore, the techniques applied in the workshops and the long term engagement of the participants in the learning environment supported a broad negotiation of meanings and contributed to understand the strengths and weaknesses of the design of UNAgora.

Keywords
Communities of practice, teacher professional development, higher education, participatory design, workshops

INTRODUCTION

The workshops described in this paper are part of a PhD project which overall aim is to foster an innovation in teaching practice of university teachers, through the use of innovative pedagogical approaches and information and communication technology to enhance learning. The project is based on communities of practice as a driving force to innovate educational practices [1] and takes place in the Universidad Nacional in Costa Rica (UNA).

The research is informed by a socio cultural perspective on human learning and development [9], where learning is regarded as a social process. It draws on the relation between the concepts of communities of practice, information and communication technology, problem oriented project pedagogy and teacher professional development. The term community of practice comes from theories based on the idea of learning as social participation.

It refers to the process of social learning that occurs when people who have a common interest collaborate over an extended period to share ideas, values, beliefs, languages, and ways of doing things [10].

Communities of practice have the potential to transform and improve teaching practice, providing teachers opportunities to learn, share and reflect on aspects related to their daily tasks [8]. Additionally the participation in these social spaces and the use of technologies in the communication and learning processes motivate teachers to learn new norms, values and practices [2].

Twenty university teachers are participating in the project. They come from five geographically distributed campuses; have diverse fields of knowledge and diverse approaches to teaching and learning as result of their own professional experiences and context. During eight months (March to October 2008) teachers have been participating in collaborative activities that help them to know each other, to develop trust and to improve their pedagogical and technical knowledge [3]. The learning environment has being designed as a framework for flexible and blended learning, regarding teachers as the main agents of their professional development, supported by an environment rich in challenges and interactions around the philosophy and methodologies of problem and project based learning [4, 5].

Given the geographic location of teachers, the community of practice (UNAgora) has a strong online component. As center of "online meeting" a space was created under the Moodle platform (Modular Object-Oriented Dynamic Learning Environment). However, in order to create an atmosphere of confidence among teachers the design considered six face-to-face meetings. Two of them are “global” meetings involving all the participant teachers and the other four meetings are localized workshop carried out in each campus. The workshops discussed in this paper took place in the last settings.

The main aim of the workshops was to reflect with participant teachers about their experiences as members of the community UNAgora during the period from March to September 2008. In a previous analysis of teacher’s experience based mainly in the produced online dialogue we found it important to address four themes: community formation, identity trajectory, the experiences of the

innovation and the design process. The analysis of these topics with teachers begins a process of mutual reflection and self-designs in the community. The four workshops have duration of about three hours and were totally audio recorded and partially video recorded.

Workshop#1: Community formation

The purpose of this workshop was to reflect and negotiate with the participants about the concepts and characteristics of communities of practice and to discover how well or not these concepts are present in UNAgora.

Two teachers and two researchers participated in the workshop. After a brief introduction we asked the participants to write in a card the main features of their teaching culture and then build a metaphor of their experience in UNAgora using Lego bricks. Through the use of modeling, the Lego bricks can take on meanings and can embody abstract concepts, thus concretizing formal elements that can otherwise be difficult to comprehend [7].

Teachers worked together building diverse components during 20 minutes and later on they explained the diverse elements present in their representation. In order to relate their metaphor of UNAgora, the concept of community of practice and teachers' culture, the researchers introduced the main elements of a Community of practice: domain, community and practice [10] and asked the teachers to identify these concepts in their representation (Figure 1).

Figure 1. The metaphor of UNAgora

This process allowed teachers negotiate among them different meanings and to discuss about the culture of sharing, collaborative learning, feelings of belonging and modes of identification as well as diverse types of learning obtained in the community, the innovation process, the influence of the technology and the role of the community in their motivation to innovate their practice.

Workshop #2: Identity trajectory

Our goal in this workshop was to discuss with teachers their learning trajectory in UNAgora and its influence in their teacher identity. Three teachers and two researchers were the participants in this workshop.

As an initial motivation and source of inspiration we started the workshop listen a short story. Then, we asked teachers to make a drawing representing their learning trajectory in the community. They used papers, pencils, stickers and picture cards. Also we bring a list of words (aptitude, attitude, identity, participation, collaboration, language, responsibility, change, values, feelings, expectations, difficulties,…) that teachers can consider when construct their story.

Teachers worked individually during 30 minutes in this process and later on they share with the rest of participants their stories. With this activity of story making and story telling, teachers place themselves in a position to make sense of their experience considering cultural, social, technological and personal aspects. We used their stories to talk about changes in identity, adoption of new language, empowerment to transform teaching practice and learning and development of new competences.

Figure 2. A learning story

Workshop #3: Experiences about the innovation

As part of their participation in UNAgora teachers have to design, implement and evaluate an innovation in their classrooms. These innovations are mainly related with the introduction of information and communication technology in the learning process. The aim of this workshop was to explore with teachers their experience as well as student's response.

Six teachers and two researchers participated in this workshop, and it consisted of two activities. First, each teacher designed a pair of glasses that represent their different perspectives of understanding their innovation

process. As second activity, we asked them to tell their experience through drawings using the following questions as a guide:

- What do I want to change?
- What I am doing?
- What impact it has for me as teacher?
- What is the students' response?
- What would I like to continue doing?

Teachers worked during 20 minutes in the activity and then they shared with the rest of participant their experience. With this dialogue we were able to understand in a deeper way the scope of the innovation, teacher and students perceptions about it, the social relationships among teachers and the impact of the community in the innovation process.

Figure 3. An innovation experience

Workshop #4: Design process

Three teachers and one researcher participated in this workshop. The main purpose was to evaluate the design of UNAgora. We asked teachers to consider themselves as designers and use their experience of seven months as members of UNAgora to design a community for the Sede Brunca. This campus is constituted by two sub-campuses with 200 km of distance between them. In the design they should consider:

- Purpose of the community
- Teacher's culture
- Different types of roles
- Structures of participation (tasks, spaces, organization)
- Social relationships
- Collaborative work
- Learning agenda
- Technological platform

Teachers worked together during 60 minutes in the activity. This process allowed them negotiate different meanings about issues as the desired profile of the participants, selection process, online and face-to-face communication, strategies to foster participation, institutional support, group work, integration of new-comers, role of the old-comers and distribution of leading and supporting roles. In addition, the workshop opened an important dialogue among teachers and researcher in order to develop a growing strategy for the community.

Figure 4. The outcome of design

FINDINGS

In this paper, we have described four different workshops used as a way to construct knowledge among university teachers and researchers. We are just in the middle of analyzing the outcome from the workshops. However, our preliminary findings supports that the different process of collaborative construction and dialogue had enabled for teachers and researchers a concrete and deeper understanding of teachers' experiences, feelings, achievements and difficulties lived by them during the eight months of their participation in UNAgora .

The techniques applied in the workshops and the participants long term engagement in the learning environment of UNAgora supported a broad negotiation of meanings and contributed to understand the strengths and weaknesses of the design of UNAgora. Furthermore, the workshops have contributed to visualize a strategy for the growing of the community.

The feedback we have received from the teachers who participated in the workshops, have been very positive. The materials and diverse techniques used in the workshops (lego bricks, story telling, drawings) have stimulated an innovative and productive dialogue.

PLANS FOR FUTURE RESEARCH

Next step is to analyze the workshops. We are going to make a hermeneutic reading of the interactions, dialogues and products in the workshop [6] in order to identify tensions and to inform the second design circle of the community UNAgora.

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