Design as an integrated multidisciplinary activity

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ABSTRACT
On the basis of two case stories and one case study, this position paper aims to show that design should be considered as an integrated approach of HCI and design disciplines.

Author Keywords
Multidisciplinary design, usability engineering, communication design, information design, integrated design

INTRODUCTION
In multidisciplinary projects the task distribution between usability engineers and designers is very often, that the usability engineers are running the user research, analyzing the context of use, developing the conceptual design and interaction techniques or evaluating a system to be optimized by expert evaluation or empirical evaluation methods. Very often communication designers or industrial designers then have the task to design the graphical aspects of the user interface. Exactly this work distribution is criticized by the designers who are used to develop user interface designs based on their own conceptual design approaches form beginning of the design process. Bringing designers in the project at a late state of the design process can result in something like "putting lipstick on a bulldog".

A CASE STORY ON MULTIDISCIPLINARY COOPERATION
Here a very small case story is presented illustrating that the design activity of usability engineers and communication designers can be a complementary completing and enriching activity. For a home automation system user interface based on a touch screen input/output device, a small but important design task was to design the virtual touch buttons. The part of the usability engineer was to provide scientific input on touch screen interfaces. Rules have been derived from research on touch screen elements [e.g. 5, 3]. The requirements for the touch elements became clear (size, feedback etc.). The designer and the usability engineer developed a prototype based on macromedia director and screen sequences based on PowerPoint. The usability engineer set up a usability test scenario and run a test. The result was that despite all the input from HCI research users tend to press also elements which were not touchable. The usability engineer formulated the requirement, that it is necessary that touch elements must be easier to be distinguished from other elements on that screen. A co-operative design process was started between the usability engineer and the designer. The usability engineer argued, that elements which have a 3 dimensional image provide affordance for users to press on. The first argument of the designer against this was that the three dimensional look is worn out. A consequent flat look is more appropriate at the moment. A series of design solutions have been generated by the designer. All solutions have been evaluated by a team of usability experts and designers based on heuristics and the results of the usability test. At the end of that process a complete design concept for the interface had been developed in order to face the button problem. The concept was that all elements which are just information or background are designed in rectangular shapes, with so called cold colors such as blue and white and with a consequent flat look. All controls which could be touched and manipulated have round shapes, so called warm colors (e.g. orange) and a three dimensional look (generated by light and shadow effects). This concept has been implemented in the next version of the prototype. With that prototype another usability test has been conducted. The results were very clear. Users had no doubts anymore which elements they can touch and which areas not. Despite the conventional three dimensional buttons, the designer was able to develop a modern look for the interface.

This small case story of a very tiny design problem shows that usability engineers and designers can combine their special knowledge in order to come to a very good solution. Usability engineers are experts in applying scientific knowledge of HCI and usability engineering methods. Designers are experts in knowledge of visualizing functions, messages and structures. In order to do this, designers apply formal elements (form, proportions, color), content ele-

ments (images, text) and typographic elements (as a mixture of formal and content elements). Furthermore, they compose the complex relationships between all these elements in a design.

DIFFERENT MODELS IN THE HEADS

At the Mensch & Computer Conference 2002 in Hamburg a workshop on "Design and Ergonomics" has been organized [8]. The interest of the participants was extremely high. In an introduction round it became obvious that about 40% of the participants were designers and the rest were HCI people. The participants have been divided into working groups of 4 to 5 persons. To all participants a usability problem has been introduced by a type of live usability test. After that the working groups had the task to create a solution for the usability problem demonstrated. After some time of group work all groups were asked to present their results. The interesting thing of the presentations was, that HCI people argue from the perspective of the user, about his or her goals and how the task can be easier for the user. The designers tend to argue to really find out what the provider of the web-site would like to achieve and how this can be optimized. Whereas usability engineers focus on the user as the main criteria for design decisions, designers focus on the customer or provider.

It seems to be that usability engineers very much have the IFIP model (user, computer and organization) [1] or the ABC-Model (in German "Aufgabe" = task, "Benutzer" = user, "Computer") [2] in their head mainly consisting of the users, her or his task and the computer as the tool. Designers very often have a sort of communication model in their head which can be traced by back to the Shannon & Weaver communication model [7]. The main characteristics of the communication model are that a provider of e.g. a message wants to send it to a recipient. Often designers put a focus on coding the message by using design means, for example to integrate a corporate design into an artifact to be designed.

On the one hand this can lead to misunderstandings when usability engineers and designers cooperate in design projects. On the other hand it is clear that both perspectives are relevant for design. If a software tool is to be designed, then of course usability aspects like user attributes, user tasks as well as social, organizational and physical environment have to be taken into account. The usability engineers are trained for that. Aspects of communicating the corporate image of the manufacturer, generating the possibility that the users and buyers of the product can identify themselves with it, giving an aesthetical impression, considering cultural context and temporization of the product's design, etc. have the same importance for product design. Designers are especially trained for that.

If a medium is to be designed then it is obvious that the provider, the message or information to be delivered, and the receiver is in the focus of the design activities [6].

THE CHALLENGE: SYSTEMATIC COMBINATION OF COMPETENCES, KNOWLEDGE, SKILLS AND METHODS

The design of an artifact embrace several design aspects and challenges as listed before. In our opinion, it is necessary that the different disciplines have to co-operate from a very early phase of the design activities in a project. Beyond that, we think that a comprehensive design approach should integrate the following aspects of usability engineering and other design disciplines like communication design, industrial design or information design:

- several qualities of a product to be designed like being usable, being understandable, transporting a corporate design, being aesthetic, etc.,
- design knowledge and design patterns,
- design relevant theories,
- design supporting methods,
- design processes.

In a design case study Hofmeester, Kemp und Blankendaal [4] demonstrated that design can be an integrated activity. In that study prototypes of an interactive product have been designed. The goal was to design a pager – a small communication device - for the target group of young women aged between 20 and 30. The special challenge was that the pager was planed to induces a sensual feeling. In order to design a sensuality impression of the pager, they followed a user centered design process., First women of the target group have been interviewed in order to elicit the relevant attributes for a sensual device. The collected attributes have been statistically analyzed in order to detect attribute clusters. On the basis of these attribute clusters designers started a creativity process and visualized their ideas by using collage technique. Based on that product concepts have been derived and prototypes have been developed. In order to evaluate whether the design ideas have met the goal to design a sensual product, the prototypes have been evaluated by using a questionnaire. This questionnaire was a semantic differential constructed out of the attributes collected in the interviews. The authors were able to show that the prototypes have been perceived as sensual devices. This case study shows that

- an unusual product characteristic like sensuality can be goal of a systematic design process,
- design can be fruitfully combined with scientific methods (e.g. interviews, statistical analysis) and typical design methods (e.g. collage technique),
- a user centered design approach can also be applied to non usability related design challenges.

We think that it is necessary to investigate and explore this type of integrated design approaches in order to design innovative and inspiring products.

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