Understanding users' experience of interaction

Sascha Mahlke

Center of Human-Machine-Systems
Berlin University of Technology

Jebensstr. 1, J2-2
10623 Berlin, Germany
sascha.mahlke@zmms.tu-berlin.de

ABSTRACT

The design of the user experience has increasingly become a goal in developing interactive systems during the last years. Since then, several attempts have been made to broaden interactive system design's traditional focus on the efficient achievement of goals to better understand additional aspects that contribute to user experience. In this paper, I first give an overview of different approaches that have taken this development into account. Based on this review I present an integrative model of user experience. This model emphasizes a combined investigation of traditional and additional quality aspects like hedonics and aesthetics. Moreover their interaction with affect and emotions as an important part of user experience are pronounced. Thus, in next steps, this theoretical basis will be used to develop a framework for user experience evaluation.

Keywords

User experience, perceived quality of use, emotional design, components of experience.

INTRODUCTION

Definitions of usability (ISO, 1998) focus on tasks and goals, their efficient achievement and the involved cognitive information processing. An instrumental focus on the design and evaluation of interactive products is taken. The technology acceptance research tradition also primarily studied instrumental aspects like usefulness and ease of use (Davis, Bagozzi & Warshaw, 1989).

Different approaches have been made to go beyond this understanding in considering other aspects of users' interaction with technical systems. Hassenzahl (2005) differentiates between approaches that focus on non-instrumental quality aspects and others that take the role of affect and emotions into account to better understand people's experience of technology.

Non-instrumental qualities

Different lines of research concerning non-instrumental quality aspects can be grouped under the three labels hedonics, aesthetics and pleasure/fun. Examples taken from each area are described below.

Hedonics

Batra & Ahtola (1990) differentiate hedonic and utilitarian sources of consumer choice and consider both to be important. Based on that Huang (2003) studied utilitarian and hedonic aspects of web performance. Hassenzahl defined the concept of Hedonic Quality in the context of HCI (Hassenzahl, 2001) and studied aspects like Stimulation, Identification and Evocation. Helander & Tham (2003) coined the expression Hedonomics as the connection between ergonomics and hedonics. In the context of consumer electronic products Han, Yun, Kwahk & Hong (2001) subdivide usability into the two aspects performance and image/impression.

Aesthetics

Tractinsky, Katz & Ikar (2000) claimed that what is beautiful is usable. Based on that a lot of studies dealt with the influence of users' perceived visual aesthetics of an interactive system. Schenkman & Jönsson (2000) studied aesthetics and preferences of web pages. Van der Heijden (2003) investigated the influence of perceived visual attractiveness on the perceived usefulness and ease of use concerning an internet portal. The importance of aesthetic aspects for user satisfaction with websites was demonstrated by Lindgaard & Dudek (2003) Lavie & Tractinsky (2004) found two aesthetic dimensions to be relevant in the website context: classical vs. expressive aesthetics.

Aesthetic quality was also studied in other domains of interactive system design. Burmester, Platz, Rudolph & Wild (1999) questioned whether aesthetic design is only an add on in the domain of medical systems, while Kleiss & Enke (1999) assessed visual appearance attributes of automotive audio systems regarding user reactions.

Liu (2003) defines two objectives for a new scientific and engineering discipline that can be called engineering aesthetics. The first intention is how to use engineering and scientific methods to study aesthetics concepts in general and design aesthetics in particular. Secondly, it is important to know how to incorporate engineering and scientific methods in the aesthetic design and evaluation process. Lindgaard & Whitfield (2004) integrate aesthetics within an evolutionary and psychological framework to be considered in human factors research.

Pleasure & Fun

Jordan (2000) argued for a hierarchical organization of user needs and claimed additional influential aspects to system interaction besides the instrumental qualities

functionality and usability of a product. He assumes different aspects of pleasure to be of importance to enhance users' interaction with the product. In Green & Jordans (2002) various topics are addressed that can be determinant conditions for pleasure with products. Already, Carrol & Thomas (1988) admonished not to confuse the concepts of *easy to use* and *fun to use* when talking about software quality. Draper (1999) analyzed fun as a software requirement candidate and Gaver and Martin (2000) presented a design approach for ludic products. Funology was defined as the move from standard usability concerns towards a wider set of problems to do with fun, enjoyment, aesthetics and the experience of use (Blythe, Overbeeke, Monk & Wright, 2003).

Affect and emotions
Pleasure, fun and enjoyment are emotions, but the approaches summarized before do not explicitly focus on emotional aspects of interaction. However, the term emotional design (Norman, 2004) recently gained significant attention. Desmet & Hekkert (2002) went a step further by presenting an explicit model of emotions according to product perception and an instrument for measuring emotional responses to products (Desmet, 2003). Zhang & Li (2004) studied the concept of affective quality (Russel & Pratt, 1980) as the ability of interactive systems to cause changes in one's affect.

Experience
From my point of view user experience can be used as an umbrella term to summarize all the relevant aspects of interaction from the user's perspective. Norman (1999) describes user experience as encompassing all aspects of users' interaction with a product.

Some approaches used the term user experience explicitly. Approaches based on Csikszentmihalyi's flow theory (1990), which became especially popular in the context of analyzing internet use (Novak, Hoffman & Yung, 2000; Huang, 2003), suggest that individuals will experience a positive psychological state (flow) as long as the challenge an activity poses is met by the individuals' skills. McCarthy & Wright (2004) took another point of view based on a pragmatist approach to experience.

Conclusion
Different aspects of user experience have been studied individually for a deeper understanding and the importance of these different aspects for user experience has been demonstrated. Nonetheless, the use of terms is partially confusing and there does not exist a clear framework that takes the different results into account. Other approaches formulated a broader framework concerning user experience (Novak, Hoffman & Yung, 2000; Huang, 2003; McCarthy & Wright, 2004), but they did not consider the detailed research on various aspects of user experience.

MODEL OF THE USER EXPIERNCE PROCESS
To study user experience of interactive systems as a whole various aspects have to be integrated to fully understand users' experience of interaction. The basic user experience process model presented in Figure 1 integrates relevant parts of user experience and provides the basis for further research. The processing of information about the quality of use on relevant experience dimensions is defined as the cognitive part within the basic user experience process. Instrumental quality dimensions are distinguished from non-instrumental quality aspects. On the one hand, this information processing is influenced by the qualities of the interactive system. The user perceives these qualities within the interaction with the system. On the other hand, this information processing leads to various consequences of experience, such as the resulting behaviour of the user, e.g. the usage of the system, or judgments.
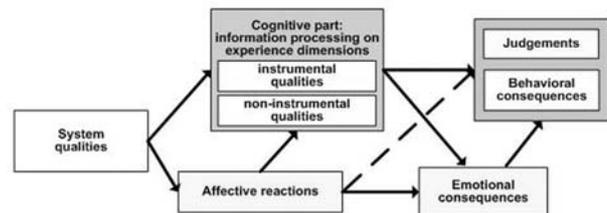

Figure 1: Basic user experience process and research framework

Affective reactions and emotional consequences play another important role as parts of user experience. They show a complex interplay with the information processing on the experience dimensions. A direct influence of system attributes on affective reactions and their impact on judgements and behavioural consequences of the experience cannot be excluded based on current research (Damasio, 1994). A distinction between immediate affective reactions while using the interactive system and more complex emotions as consequences of product use is integrated into the model. An influence of the perceived quality of the interactive systems on emotional consequences as part of the appraisal process of emotional consequences is assumed (Scherer, 2004).

Experience dimensions: the cognitive part
As part of this research one study examined the role of subjectively perceived instrumental and non-instrumental quality dimensions of websites in forming an *intention to use* a website as a predictor of behavioural consequences (Mahlke, 2002; 2005). Four experience dimensions *perceived usefulness, ease of use, hedonic quality* and *visual attractiveness* representing aspects of the cognitive part of user experience were investigated in the domain of websites.

Perceived usefulness and ease of use are defined in Davis' Technology Acceptance Model (Davis, Bagozzi & Warshaw, 1989) as the main factors of the acceptance

of a system. Hassenzahl (2001) studied the importance of hedonic quality aspects of software defined as non task-related aspects like originality or innovativeness. Van der Heijden (2003) considered the influence of perceived visual attractiveness in a website context. The intention to use as a predictor of system usage was studied as one consequence of user experience (Davis, Bagozzi & Warshaw, 1989).

The results of a factor analysis showed that users perceived the four assumed experience aspects consistently and mostly independent. Together, the four factors explained approx. 79% of the total variance of the intention to use a website. The regression analysis to predict the intention to use demonstrated that the perceived usefulness had a main influence and explained 41% of the variance of the intention to use. However, the other three experience dimensions also contributed significantly to the intention to use. Perceived ease of use explained 14% of the variance, perceived hedonic quality 9 % and perceived visual attractiveness 6%.

In addition to the four experience dimensions that were integrated in this study further concepts that were described before may be of importance for user experience. Additional concepts in the website context may be trustworthiness, especially for e-commerce websites or the support of social aspects like communication or cooperation.

Affective reactions and emotional consequences

The relevance of emotion and affect as part of the user experience process has not been studied empirically within this approach so far. Innovative methods for measuring emotions during interactive experiences (Desmet, 2003) will be integrated to study the interrelation of experience dimensions on the one hand and affective reactions and emotional consequences on the other hand. The use of psychophysiological methods to record the process of affective reactions marks a promising approach (Ward & Marsden, 2003; Branco, Firth, Encarnao & Bonato, 2005).

Judgments and behavioural consequences

In the basic user experience process further consequences of experience besides the intention to use as a predictor for usage of interactive systems may be relevant. Judgments are examples of further interesting categories of consequences. Hassenzahl (2001) studied the concept of judgement of appeal as an evaluative concept that can be considered as another result of experience.

CONCLUSION AND NEXT STEPS

The theoretical background of this approach to understanding users' experience of interaction was described. An integrative model was formulated based on the current literature. First empirical results concerning the importance of four experience dimensions were presented.

There are many open issues regarding affective and emotional reactions and further consequences of experience. A next step in understanding the interrelation of these different constructs is more empirical validation of the model. Methods for measuring relevant aspects of experience especially emotions are needed and have to be integrated. Besides that the applicability of the user experience process model of interactive system use in other than the web domain has not been demonstrated yet. To test its potential the experience evaluation method is currently applied to two different domains: consumer electronics and in-vehicle information systems.

Another complex of questions that so far has not been answered is which design characteristics and features support a positive experience. The crucial question is how to design artefacts that cause desired perceptions of qualities, affects and emotions and lead to consequences the designer wants to achieve. While design for usefulness and ease of use is reasonably understood, the question about what leads to an interactive system being perceived hedonic or emotionally pleasing is not answered (Han, Yun, Kim & Kwahk, 2000; Kim, Lee & Choi, 2003). For now, from my viewpoint the approach is mainly suitable for evaluating user experiences.

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