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Hedonic and pragmatic halo effects at early stages of User Experience

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ABSTRACT

User Experience (UX) has emerged as a comprehensive concept which provides a holistic perspective on users' interaction with technology. This concept can be characterized as a multidimensional phenomenon that comprises both, the perception of different product qualities as well as emotions that arise while using a product. The interrelations of these components are described in the 'Component Model of User Experience' (CUE model), which serves as the theoretical basis for our experiment. UX can be investigated in different phases of usage. In our experiment, we examined product perceptions and emotions in early phases and for short-time usage. Sixty participants employed different versions of mobile digital audio players which were systematically varied with respect to visual aesthetics and usability. Essential aspects of UX, i.e., perceptions of visual attractiveness and usability, as well as emotional responses were measured at three stages: Before interacting with the device, after an exploration (2 min) and after working with the system for a short time (15 min) to solve a given set of tasks. Data was analysed using a $2 \times 2 \times 3$ mixed MANCOVA. The results of the experiment show that influences of visual aesthetics and of usability on quality perceptions as well as emotions change during these early stages. Moreover, evidence for two different halo effects was found: On the one hand, visual aesthetics influenced perceived usability in the beginning. On the other hand, the usability of the device impacted the perceived visual attractiveness and emotional responses at later stages. To account for these findings, we suggest to distinguish a hedonic halo effect from a pragmatic one. Based on the results for both effects, we propose that two mechanisms may be responsible for the effects during short-time usage, one of them being cognitive in nature, the other emotional.

1. Introduction

Nowadays, usability, usefulness and utility are no longer regarded as sufficient quality features for most technical devices. Instead, User Experience (UX) has emerged as a comprehensive approach for designing and investigating interactive systems. The ISO norm defines UX as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service" (ISO 9241-210, 2010, p. 7). While this definition is rather broad, a number of alternative approaches define UX more precisely and specify how it can be measured or categorized (e.g., Alben, 1996; Forlizzi and Battarbee, 2004; Hassenzahl and Tractinsky, 2006; Karapanos et al., 2009; Law et al., 2009; Mahlke, 2008). As a basis for our own research, we developed a theoretical framework called CUE model (Components of User Experience; see Fig. 1), which integrates central issues of different analytic theories and offers a comprehensive framework for empirical studies (Mahlke, 2008; Thüring and Mahlke, 2007). The CUE model can be helpful to find an appropriate set of dependent variables and measurements. Since the present study aims at investigating the relationship between different components of our framework in more detail, we give a brief overview of the components and the relations of the model.

1.1. The CUE model as a comprehensive framework of User Experience

According to the CUE model, each interaction between a system and its users is determined by user characteristics, contextual components and system properties. On behalf of the users, attitudes and expectations towards the system as well as personality traits and current mood may affect the interaction. Contextual components include the physical and social environment together with any tasks that users aim to accomplish. With respect to system properties, two types are distinguished which Mahlke termed 'instrumental' and 'non-instrumental' qualities (Mahlke, 2008). This distinction between two different qualities traces back to Hassenzahl (2002) who called them 'pragmatic' and 'hedonic'. Both types are inherent features of the system that can be objectively described or – for the purpose of experimental investigation – be deliberately manipulated. Typically, instrumental qualities are related to technical features, such as suitability for a task, self descriptiveness and controllability (see ISO 9241-110, 2006), while non-instrumental qual-

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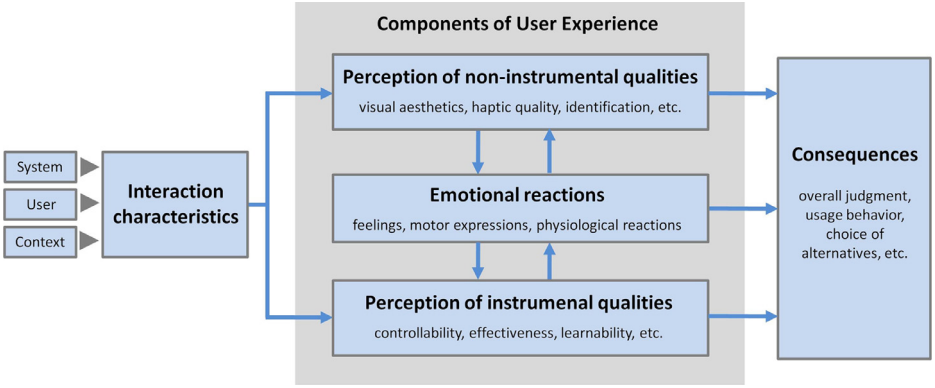

Fig. 1. Components of User Experience (CUE model) by Thüring and Mahlke (2007).

ities refer to design features (e.g., materials, form and colour combinations). User characteristics, contextual components and system properties constitute specific interaction characteristics which determine the user's experience with a technical artefact. As core components of this experience, the CUE model distinguishes between the user's perception of instrumental and non-instrumental qualities as well as emotions that occur during the interaction. The term 'perception' is used in a broad sense and is not restricted to sensory input and perceptual organization. It also comprises 'higher' cognitive processes, such as recognition, categorization and judgment. According to cognitive theories on emotion, such cognitive processes accompany emotional reactions (e.g., Scherer, 1984). Emotions, as such, consist of physiological activation, motor expressions, and subjective feelings, which can be characterized in terms of valence and arousal (Russell, 1980).

In the original CUE model, the perception of both, instrumental and non-instrumental qualities is capable to trigger positive or negative emotions of varying intensity. Psychological research has shown that in turn emotions can impact on perception, attention and decision-making (e.g., Isen, 2000; Brosch et al., 2013) as well as on judgment and thought (e.g., Damasio, 1994; Clore and Huntsinger, 2007). Therefore, the current version of the CUE model postulates bi-directional relationships between perceived product qualities and emotions which are elicited during interaction as shown in Fig. 1 (Minge et al., 2016a, b). Jointly, the perception of both qualities and emotions finally determine the overall appraisal of a system, i.e., the user's general opinion as well as future behaviour and usage.

The CUE model has served as a theoretical basis for a number of studies which investigated the perception of instrumental as well as non-instrumental system qualities (Mahlke and Thüring, 2007; Thüring and Mahlke, 2007; Mahlke, 2008). Especially two features were experimentally varied in these studies: the usability of the system and its aesthetics, in particular the visual aesthetics of the interface.

Usability as an instrumental quality strongly influences task completion, e.g., when flaws obstruct users from reaching their goals thus diminishing their performance or increasing their workload. According to the ISO norm (see ISO 9241-11, 1998), system usability comprises the accuracy and completeness of goal accomplishment ("effectiveness") in relation to the necessary costs ("efficiency") as well as the absence of discomfort ("satisfaction"). A variety of guidelines, heuristics (e.g., Nielsen, 1994), design rules (e.g., Norman, 2005; Shneiderman, 2004) and the dialogue principles (ISO 9241-110, 2006) can be used for designing interactive systems and evaluating their usability.

Visual aesthetics as a non-instrumental quality play a major role since they are perceived at first glance (Lindgaard et al., 2006; Lindgaard et al., 2011; Thielsch and Hirschfeld, 2012) and determine instantaneously if users are attracted by the system or not (Schenkmann and Jönsson, 2000; Crilly et al., 2004), even if users typically underestimate the importance of visual aesthetics (Thielsch et al., 2014). Immediate and stable aesthetic judgments have been found not only for web applications, but also in the mobile domain (Miniukovich and De Angeli, 2015). Visual aesthetics is in the focus of many disciplines and the question of what constitutes an aesthetic appreciation has a long tradition. We follow an empirical approach after which aesthetics are related to an immediate pleasurable subjective experience that is quantifiable and that can be systematically influenced by manipulating specific design features (Moshagen and Thielsch, 2010). In the CUE model, these features are part of the objective interaction characteristics caused by the system's non-instrumental qualities. Lavie and Tractinsky (2004) distinguished between a classic and an expressive dimension of aesthetic appreciation. While the classic dimension refers to common design rules, such as symmetry, order, and cleanliness, the expressive dimension pertains to originality and to breaking design conventions. Psychologically, classic and expressive aesthetics can be explained by different levels of arousal potential (e.g., Berlyne, 1974; Martindale et al., 1990). Accordingly, preferences are affected by both, a rather limited complexity and an advanced, but yet acceptable level of novelty (Hekkert et al., 2003).

1.2. *The influence of usability and visual aesthetics on User Experience*

A line of research focuses on investigating the influence of system usability and visual aesthetics on the core components of UX, i.e., the perception of instrumental and non-instrumental qualities, emotions, and consequences. Results reported by Mahlke and Thüring (2007) indicate that system usability and visual aesthetics affect the perception of the respective qualities as well as the overall appraisal of the system. The impact of system usability was generally stronger than the influence of aesthetics. Emotions were affected by these two factors as well. This was also confirmed in an experiment by Mahlke and Minge (2008). They showed that a system with usability flaws led to negative emotions of high intensity while the interaction with a flawless version of that system went along with positive feelings of lower intensity. Both versions were also accompanied by different levels of physiological activation, and they were appraised differently, i.e., the flawless version was rated as more capable, pleasant and convenient.

In a study on fifteen websites from different domains, Seo et al. (2015) also investigated the impact of perceived usability and perceived aesthetics on emotions. According to their results, both features were positively correlated with valence, but not with arousal. Saariluoma and Jokinen (2014) elicited emotions by asking university students to perform tasks with systems they were not familiar with. They discovered two groups of emotional substance in this context, which they called competence and frustration. Both were associated with valence, i.e., 'how pleasant or unpleasant the emotions were' (p. 307), but not with arousal. Aranyi and van Schaik (2015) adapted the CUE model to de-