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Understanding the most influential user experiences in successful and unsuccessful technology adoptions

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A B S T R A C T

Understanding processes underlying technology adoption or non-adoption is an important research theme often addressed using the technology acceptance model (TAM) approach. The objective of this research was to investigate most influential user experiences in successful and unsuccessful technology adoptions using user experience related concepts and methods in conjunction with the TAM. Participants ($N = 76$) described their most influential user experiences related to one successful and one unsuccessful technology adoption process and evaluated both experiences using rating scales, including the central TAM related scales and user experience related scales probing emotions, psychological needs, user values, task load, and the impact of technology on the user's well-being.

The results suggested that user experience and technology acceptance related viewpoints can complement each other in order to gain a more holistic understanding of the factors affecting the success or failure of technology adoptions, and the results showed how these variables typically behave in both contexts. The overall valence of user experience was significantly affected by perceived usefulness, the fulfillment of psychological needs, and the salience of negative emotions in the most influential user experiences of successful adoptions, and by perceived usefulness, output quality, and the salience of negative emotions in the unsuccessful adoptions.

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1. Introduction

Technology adoption is a growingly important research theme, as new technologies are being rapidly introduced, and it is currently typical for a user to have many personal devices and interact with multiple information technology services including different commercial and public services. Different information technology devices and services are now also increasingly used in the less developed countries. From the user's viewpoint, successful technology adoption is important in order to fully participate in the rapidly changing modern society and it is also crucial in many professions. Those who cannot adopt new technology are limited in their ability to become productive members of their communities. Understanding the factors influencing technology adoption helps us predict and manage, which technologies are successfully adopted, by whom, and under what kind of conditions. Designers of technology and technology-based services can also use that information toward building systems, which can overcome the most common barriers in technology adoption.

The most popular approach for studying technology adoption has been the Technology Acceptance Model (TAM) and the related questionnaire-based research methods. Davis (1989) developed the original TAM model based on the theory of reasoned action (Fishbein & Ajzen, 1975). In the TAM model, system usage behavior is determined by behavioral intention to use, which is affected by perceived usefulness, or "the degree to which a person believes that using a particular system would enhance his or her job performance" and perceived ease-of-use or "the degree to which a person believes that using a particular system would be free from effort". These perceptions are in turn affected by a number of external variables The original model was later extended into TAM2 (Venkatesh & Davis, 2000), in which the external variables of subjective norm, image, job relevance, output quality, and result demonstrability were identified, affecting the perceived usefulness and behavioral intention variables of the original model. The model also introduced experience of using the system and voluntariness of use as moderating variables. Later, Venkatesh and Bala (2008) released the third version of the model, TAM3, in which further determinants of perceived ease of use were added to the model: computer self-efficacy, perceptions of external control, computer anxiety, computer playfulness, perceived enjoyment, and objective usability.

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Despite its importance for the technology acceptance research field and practical studies, TAM has also received a great deal of criticism. For example, Legris, Ingham, and Collerette (2003) suggested that TAM and TAM2 models explain only about 40% of information technology use and significant factors are not included in the models. Bagozzi (2007) published a commentary article pointing out a number of limitations with the TAM model and the related research. A major conclusion was that besides variables included in TAM, new variables are needed for understanding the users' decision making related to technology adoption and these variables are likely to be grounded in emotional, social, and goal-directed behavior research.

Recently, these kinds of variables have been applied to the study of interactive systems in the research field of user experience (UX), which is currently one of the most significant directions in human technology interaction research. While there is plenty of literature on technology acceptance and a growing body of research on user experience, only a little research exists combining both research directions. Some of the most potential user experience related concepts include emotions, user needs, and user values, all of which have been already applied successfully in practical user experience studies based on well-established theories from psychological research. Another promising concept is experienced well-being impact of technology, which can be assumed to be especially important when studying technologies used daily or frequently such as different work systems and equipment. In the following chapters, we introduce these user experience related concepts in detail and present the aims and hypotheses of the current study.

2. User experience

User experience is a growing research field, which has in recent years gained considerable interest from both scholars and practitioners. Generally, the research field of user experience is seen to include all factors, which affect the user's interaction with and experience of a system or a product. At the core of the concept is experience itself. The current scholarly conception of user experience mostly follows the psychological line of thinking, in line with the "technology as experience" approach (McCarthy & Wright, 2004), which shifted the focus of product design from technological and pragmatic aspects toward subjective and emotional qualities of interaction with products. Many different definitions have been suggested for user experience stressing different aspects of experience or factors affecting user experience. However, most researchers and practitioners agree that user experience is subjective (vs. objective), holistic (vs. instrumental), situated (vs. abstract), and dynamic (vs. static) (Hassenzahl, 2010; Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009). Below we briefly introduce some of most important established and emerging concepts and methods of user experience research, all of which are also applied in the current research.

2.1. Emotions

In the study of human experiences, emotion is generally seen one of the most central and pervasive aspects and consequently they also play a central role in understanding user experiences. Most of the scientific research on user experience follows the notion is that emotions are integral to experiences and they are also intertwined with our actions (Carver & Scheier, 1989; Hassenzahl, 2010). Emotions can be studied from two main viewpoints: dimensional and discrete emotions, which are currently seen as complementary to each other. Empirical research using the dimensional viewpoint has shown that emotions can be organized along two main dimensions: valence (ranging from negative to neutral and positive affect) and arousal (ranging from very calm to neutral and very highly aroused). From the discrete emotions point of view, there are numerous theories and methods on which particular emotions are the most central and should be included in emotion research. One of the most widely used methods has been the Positive Affect Negative Affect Schedule (PANAS, Watson, Tellegen, & Clark, 1988), which studies experienced emotions through a balanced set of ten positive and ten negative emotions (e.g. inspired, excited, scared, distressed). There is evidence about the reliability and validity of the method in a general population (e.g. Crawford & Henry, 2004). This method enables calculating salience scores separately for positive and negative emotions, as well as an affect balance score. This is especially useful, as there is evidence that people can experience both positive and negative emotions as parts of the same experience (Russell & Carroll, 1999).

Emotion-related concepts have a history of being used in technology adoption studies, but for example, Straub (2009) has noted that there is not a sufficient empirical basis for understanding the influence of emotions on the technology adoption process. The research on emotion-related constructs in technology adoptions is mostly limited to the notions included in Technology Acceptance Model 3 that perceived enjoyment and computer anxiety are (positively and negatively, respectively) related to perceived ease of use (Venkatesh, 2000). Other researchers have also found these variables to be related with other TAM variables in different contexts. For example, Van der Heijden (2004) found that perceived enjoyment can be directly related to intention to use in hedonic information systems (e.g. a movie website). There are, however, also a few studies that have used more advanced emotion concepts. Cenfetelli (2004) averaged a range of different positive and negative emotions and found that positive emotions were positively related and negative emotions were negatively related to perceived ease of use of the TAM model in an e-business context. Kim, Chan, and Chan (2007) used the two main emotional dimensions: valence and arousal, in a study focusing on the continued use of mobile Internet services, and found that both dimensions were positively related to attitude toward using the services (the concept which predicts actual intention to use in TAM2). Based on appraisal theory, Beaudry and Pinsonneault (2010) developed a framework of four emotions: anger, anxiety, excitement, and happiness, and found that these emotions were either directly or indirectly related to IT use among bank account managers.

2.2. Psychological needs

Another central concept in understanding human experiences and also well-being is the concept of psychological needs. Self-determination theory (Deci & Ryan, 2014; Ryan & Deci, 2000) suggests that three needs are of central importance: autonomy (to actively participate in determining own behavior without external influence), competence (to experience oneself as capable and competent in controlling the environment and being able to reliably predict outcomes), and relatedness (to care for and be related to others). Sheldon, Elliot, Kim, and Kasser (2001) presented a model of ten candidate psychological needs extending self-determination theory with seven other needs: self-actualization-meaning, physical thriving, pleasure-stimulation, money-luxury, security, self-esteem, and popularity-influence. They also presented a questionnaire method for studying the degrees of satisfaction for the ten needs using 30 statements (three statements for each need) and applied the method in two studies on the most and least satisfying experiences of college students in two different cultural settings. The results showed that autonomy, competence, and relatedness were consistently among the most salient needs, together with self-esteem needs.