Lost in Time: The Meaning of Temporal Aspects in User Experience

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Abstract
The long-term and dynamic nature of user experience (UX) is challenging both UX design and evaluation activities. Although the CHI community acknowledges the importance of a temporal perspective on UX, we are still lacking an understanding of time and the meaning of temporal aspects in UX. In order to close this gap, we organized a workshop at NordiCHI 2012 exploring the topic with researchers and practitioners, especially searching for a common understanding of long-term UX and its relevance to the field. In this paper, we analyze the current state of the topic, discuss definitions and theoretical models based on previous work and the outcome of the workshop. We conclude with a working definition for long-term UX, its relevance for design and summarize future research directions.

Author Keywords
User experience; long-term user experience; long-term usage; temporal aspects; time; models; theory

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General Terms
Human Factors, Theory, Design
Introduction and motivation

User experience (UX) is most often characterized to be subjective, context-dependent, and dynamic [7]. Yet, the meaning of dynamic and temporal aspects in the concept of UX or their relevance in designing and evaluating UX is not widely discussed. Although temporal aspects are considered important, there is still lack of a clear understanding what they mean for design. They can be seen from the perspective of a ‘moment to moment’ experience or a ‘remembering’ experience. During an experience, time may not be relevant, but afterwards some of the experiences are staying in memory and influence the overall evaluation of the product [11]. Although, Norman [8] and Karaparos et al. [4] have argued for the importance of memory, the ‘moment to moment’ view seems to be prevalent in HCI. For example, Vermeeren et al. [14] show that 63% of UX evaluations were focusing on a single episode in which a user explores a specific design feature to address a task goal.

In this paper, we reflect on the current state of the topic, definitions of long-term UX and theoretical models based on related literature and results from a workshop we organized at NordCHI 2012 [5]. Thus, we believe to contribute another piece in the puzzle around the meaning and relevance of temporal aspects in UX research.

What is long-term user experience?

There has been a lot of effort to define and scope the concept of UX (e.g., [7]) and more recently to explore its theoretical foundations [10]. However, related aspects of temporality of UX still require clarification. Thus, we organized the workshop attended by 6 researchers and 4 practitioners from 6 different European countries, representing a variety of different viewpoints. Although we refer to a small sample of UX experts, we can use the participants’ input as a starting point and build on their broad spectrum of disciplinary backgrounds (including computer science, design, marketing and social sciences). We asked participants to define “long-term UX” in their own words. Figure 1 shows examples of the definitions. The longitudinal view was mentioned often but otherwise the definitions represented different views and the exact scope of long-term UX is difficult to grasp.

The exact definition of long-term UX is also difficult to find in the literature. The UX White Paper is an attempt to provide a consensus by a group of UX researchers [13]. It does not give a definition to long-term UX, but separates a specific change of feeling during interaction (momentary UX), appraisal of a specific usage episode (episodic UX), and views on a system as a whole, after having used it for a while (cumulative UX). Cumulative UX is seen to be formed through a series of usage and non-use episodes, that may span months of usage, or longer. Of course, the time period depends on the type of product or service and how often it is used. Kujala et al. [6] define long-term UX as the relationship of a user with a product or system emphasizing more the personal experience over time. Their empirical results suggest that the trend of experience episodes is influencing the overall evaluation of a system.

Concluding from the above perspectives, we could state that long-term UX is characterized as the overall – summarized momentary experiences – subjective evaluation of a product and its personal meaning after an extended period of usage. We explore this general definition further in the following sections.
Models of long-term user experience

Theoretical models provide a more thorough understanding of the temporal aspects of UX. Karapanos et al. [3] for instance describe how the distribution of different kinds of experience episodes change over time, starting from an orienting learning phase to a final emotional attachment phase, as weeks progress (see Figure 2). Expectations and particularly anticipations are discussed as relevant influences in long-term use, fostering the subjective judgments of changes over time.

Another approach is presented by Pohlmeyer et al. ([11][12]) introducing a detailed model of continuous UX, which includes a series of experiential episodes spanning an entire UX lifecycle (see Figure 3). According to the ContinUE model, a user experience already starts with the anticipation of using the product, includes the use experience itself as well as the reflection upon a use experience. The optional repetitions of these three phases are indicated with dashed lines in Figure 3. An interesting aspect posits by Pohlmeyer [11] is that "a user experience continues as long as memories last" (p.177). A user can still experience the product and its meaning in retrospect through memories. In the model, an overall, summative evaluation is differentiated from formative evaluations of single use situations (reflective experiences). As memories affect future decisions, e.g. considerations regarding the use of products of a similar type (prospective experience), they are of key importance also for design. It is noteworthy that real-time experiences and the memories thereof can differ substantially, also stressed by Kahneman and Riis [1].

Figure 2: Temporality of experience by Karapanos et al. ([3], p. 732).

Figure 3: Model of Continuous User Experience: ContinUE [11] (Image taken from Pohlmeyer, 2011, p.177).
The strength of the ContinUE model is that it covers an entire user-product lifecycle and takes memory and different influencing factors into account. In addition to a variety of possible contexts, it is not only the user that changes over time (e.g., learn); the system too might mature (e.g., adapt) and eventually age (e.g., break). Furthermore, the interrelations of the user-system-context triad can also develop as a consequence of repetitive and long-term use [11][12].

Apart from the above models (being aware there are many more to consider) we also combined the different viewpoints from our workshop participants into one model on long-term UX (see Figure 4). The model not only provides insight on the experiential aspects that are evolving over time, but also highlights the relevance of the person’s background as novice or expert. The participants did not mention reflective experiences, but long-term UX was seen to consist of momentary experiences that are summarized to overall evaluations of the experiences at some points (as seen in the ContinUE model). During the momentary experiences, a user is learning to use the product and develops from a novice to an expert user. Meanwhile, the relationship between the user and product is evolving (as seen in [3]). Feelings change and meaning may arise. This model (yet high-level and in its initial stage) was more concerned with emotions and meanings than users’ experience during the use, and points to the relationship between memories and experience [2].

**Relevance to the field**

The concept of long-term UX brings the lifecycle point of view to design. Designers want users to use their products not just once but several times and also recommend it to others. Long-term UX is no longer a single episode with a product but a series of episodes having consequences for the user and sometimes to society as a whole.

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**Figure 4:** "Long-term UX" model derived from the workshop at NordiCHI 2012
As one of the workshop participants described it: "long-term UX has meaning and provides real value for users". In addition to practical value, all products have some effects on life, e.g., how much time users are spending on using them or how they respect themselves and others. However, in many cases users cannot truly evaluate the personal consequences of a product before they have used it for a prolonged period of time. It is also possible that their evaluation changes over time when they learn to use the product and encounter its consequences [6]. Sometimes UX may be affected by the whole lifecycle or even by the knowledge of how to dispose the product after use.

The long-term nature of UX is a challenge to both design and evaluation. Product development needs user feedback as early as possible in the design process. However, at the same time, continued feedback across different experience episodes is required to successfully design for long-term UX. Thus, in addition to evaluating UX as early as possible, we need to follow UX in real usage: how is the product influencing users and their lives and what are the most influential experiences that the users remember afterwards that need to be reconsidered in the next product version? In addition, we have to gain a better understanding on how to design memorable and positive long-term user experiences in the first place.

**Conclusions on the meaning of long-term UX**

It could be argued that long-term UX is just UX over a longer period of time, but the concept is much more complex. The context is a crucial component in UX; the same applies to long-term UX especially because time is radically changing the context and meaning of UX.

As the theoretical models suggest, there are several variables that are changing over time. UX is not a stable phenomenon as the user is changing, the system may change and the overall context of use is changing [11][12]. It is also known that the relevance of different aspects of UX is changing over time [3]. Some products and services are used for months and years and thus, it is important to understand how UX and consequently the appraisal of a product or service are evolving over time. Note that UX over time is not just passive changing – instead, users have an active role in interpreting its meaning [3], which will define future actions and design decisions [9].

One important factor is memory. As users use a product for months and may face hundreds of experience episodes over time, they need to rely on memory when they form an overall evaluation of the product. Kahneman [2] alerts us to look at two fundamentally different concepts of self: the ‘Experiencing Self’ and ‘Remembering Self’, where the latter one defines people’s decisions and future behaviour, and deserves more attention by designers.

**Future directions**

Future research in terms of empirical data and long-term studies is needed to verify the theoretical models. We need to understand what makes varied product categories successful in the long run, how experiences are cumulating and how users reflect past experiences. In practice, new practices and methods are needed for designing for positive long-term UX. Moreover, we need to strengthen the theoretical foundation for long-term UX along with the discussion on the theoretical roots for UX research and practice [10], emphasizing the changing character of UX – its temporality.
Along with this broader view, it would be important to look beyond the HCI plate and consider other models used, for instance, in marketing and business (e.g., particularly process models, which provide insights on consumers’ decision making processes, influenced by individual and environmental aspects). Only by opening up our viewpoint and considering different perspectives ‘time’ will not just be a word to be lost in, but a crucial concept to work with in future designs.

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