From usability to user experience: conceptualisation and relationship

Liene Viļuma
Faculty of Social Sciences, Faculty of Computing,
University of Latvia, 19 Raina Blvd, Riga, Latvia
E-mail address: liene.viluma@lu.lv

Abstract

Over the last two decades more and more information has been represented digitally, and communication increasingly has been happening over multiple channels, many of them digital. Availability and use of various interactive devices and the Internet has grown, making human-computer interaction (HCI) ubiquitous. At the same time the whole discipline of HCI has evolved, and its basic concepts like design and usability have become more relevant as people communicate or access information via technological artefacts.

Recent developments in HCI research have shown an increasing interest in the experience that people have when using a system (products, services or artefacts that a person can interact with through a user interface). The term 'user experience' is widely used but its multidisciplinary nature has led to several definitions and perspectives. User experience extends the more traditional concept of usability, focused primarily on ease-of-use, by emphasizing pleasure aspects of interaction. Although a considerable amount of literature has been published proposing many definitions and models of user experience, no real consensus has been reached partially because of its complexity.

This paper provides a literature overview of the components and temporal phases of user experience covering different viewpoints of user experience. It traces the development of the concept and attempts to understand how the different approaches to user experience relate to each other. Despite the importance of emotional, hedonic aspects of interaction the shift of focus away from utilitarian qualities of interaction may be premature. Basic functionality and usability requirements should be met prior to adding novel or fun design elements that make the experience pleasing.

Key words: usability, user experience, human-computer interaction

Introduction

Ever since the term 'user experience' (UX) was first used by Donald Norman, Jim Miller and Austin Henderson (1995) more than two decades ago, there has been a debate about the scope and definition of UX. Definition of UX has been named as one of the biggest challenges created by the new focus in human-computer interaction (HCI) as recently as 2014 (Law, & Abrahão, 2014). According to Effie Lai-Chong Law, Virpi Roto, Marc Hassenzahl, Arnold P. O. S. Vermeeren and Joke Kort (2009), this lack of conceptual clarity impacts our understanding, communication and collaboration. It can be explained by the fact that UX is asso-

ciated with a wide range of fuzzy and dynamic concepts and is used as a generic term combining several HCI notions.

According to M. Hassenzahl and Noam Tractinsky (2006), UX is influenced by "the user's internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and the context (or the environment) within which the interaction occurs (e.g. organisational/social setting, meaningfulness of the activity, voluntariness of use, etc.)" (p. 95).

The past decade has seen an increasing awareness of the complexity of users' experiences (McCarthy, & Wright, 2004) and the importance of understanding this complexity for design. UX accentuates the importance of the subjectivity of users' experiences and quality judgements. These personal interpretations of a system's quality will influence future interaction with the system and may be communicated to other users with the potential of influencing their subjective experience (Hassenzahl, & Tractinsky, 2006).

Although a substantial amount of research has been published about UX, knowledge and concepts related to UX are scattered. Much uncertainty still exists about the relationship of various UX factors and their relative importance. This paper traces the emerging role of UX in the broader context of HCI research, examines the most significant models and principles, and highlights the importance of the temporality of UX. An additional purpose of this study is to explore the relationship between usability and UX, trying to establish a holistic understanding of UX.

Evolution of HCI research

HCI is the study of human interaction with a variety of systems, such as websites, software, electronic products and services, therefore the general term 'systems' is used in this paper. Historically, usability (known as usability engineering) used to be the primary concern of HCI.

The first HCI wave investigated human capabilities in computer use, focusing on cognitive psychology and ergonomics. The user was seen as a passive, unmotivated individual trying to efficiently use of computer. The second wave brought the idea of the user as an active individual who controls the system, and the focus shifted to ease of use and user friendliness (Bødker, 2006). Usability is characterized as task-oriented and performance-based, it emphasizes goal achievement. However, this approach tends to see the person as a 'user' and artefact as a tool, thus taking a limited view of people. Three canonical usability metrics – effectiveness, efficiency and satisfaction – define usability in ISO standard 9241-11 (ISO, 1998). In practice the satisfaction element of usability testing often amounts to investigating whether the product frustrates the user or not (Blythe, & Wright, 2005, p. XVI).

As computers move out of the workplace and enter homes, leisure usage and products that are an integrated part of a user's everyday life become more important. The advent of ubiquitous computing adds to this progress. When technology is integrated in a user's everyday life, aspects like satisfaction, entertainment,

enjoyment, a sense of community and identity play a significant role (Wright, McCarthy, & Meekison, 2003). All this contributes to a shift of focus from more concrete, functional aspects of product design to more abstract, subjective qualities of interaction, which in turn cause the emergence of user experience as a distinct concept (Hassenzahl, & Tractinsky, 2006). This historical trend contextualises the idea that "once technology becomes mature, it recedes into the background, supportive of the total experience it provides" (Cherny, 2008, p. 207).

Approaches and frameworks

UX can be viewed from different perspectives; it can be seen as a phenomenon, as a field of study, or as a practice. In this paper the main focus is on UX as a phenomenon. The notion of experience is inherent to our existence as people. Experience in general covers everything personally encountered, undergone, or lived through. UX differs from experience in the general sense, in that it explicitly refers to the experience derived from interaction with a system. UX is strongly influenced by attributes and design elements of the system, the context of use and the characteristics of the user. However, the focus of this paper is the experience of interaction that is felt by the user.

The concept of 'experience' has been already long studied in philosophy as well as in behavioural and social sciences. Approaches to experience in human--technology interaction are very diverse. In attempting to understand UX, several frameworks have been developed focusing on different aspects – emotions and affect, non-instrumental needs, aesthetics etc. Flow (Csikszentmihalyi, 1990), fun (Carroll, & Thomas, 1988; Malone, 1982; Monk, Hassenzahl, Blythe, & Reed, 2002), pleasure (Jordan, 2000), beauty (Tractinsky, 2004; Hassenzahl, 2004) have all been related to UX. As software becomes more "social," the experience can be co-constructed and shared in social interaction, resulting in the so called 'co-experience' (Battarbee & Koskinen, 2005). Two major perspectives can be identified among these frameworks. A number of these approaches have drawn heavily upon cognitive science, emphasizing the need for representations and understandings of UX that are precise, measurable, comparable, and generalisable (Hassenzahl, 2005; Jordan, 2000; Norman, 2004). Others have adopted more holistic, the so-called 'third wave' approach rooted in phenomenology and pragmatist philosophy that emphasize the richness of situated actions, the inseparability of mind and body, and the contextual dependency of experiences (Forlizzi, & Ford, 2000; McCarthy, & Wright, 2004; Kaye, 2009). Phenomenological accounts find their foundations in the arts and humanities rather than the sciences and argue that experience and emotion are too ephemeral and complex to measure. Proponents of UX are more optimistic and seem to share understanding that UX needs to clarify and operationalise constructs to be taken seriously within the context of HCI (Hassenzahl, Hvannberg, & Law, 2006, p. 10).

Ideas represented by UX are important, but by no means original. The experience of computer use has been referred to in literature long before the wide-

spread use of the term 'user experience', with the emergence of WIMP (windows, icons, menus, pointers) interfaces and direct manipulation. Ben Shneiderman describes seven qualitative aspects or 'positive feelings' that users report including 'mastery of the interface' and 'confidence in the capacity to retain mastery' (Shneiderman, 1986, p. 214).

Among the components of good UX a common theme is *flow* (Finneran, & Zhang, 2003; Novak, & Hoffman, 2000). Long before UX became a major trend Csikszentmihalyi (1975) recognized the role of optimizing the experience. His theoretical model suggests that a state of 'flow' is achieved when an optimum match between the level of skill and challenge occurs. As challenge increases the user needs to have increasing skills to stay in a state of flow, a state of focused activity. If the challenge is too high for the user's skills, anxiety can occur, and if the skill level is too high for the challenge, the user gets bored. The concept of flow has endured and been tested in several domains, becoming especially popular in the context of web interaction (Cho, & Kim, 2012; Webster, & Ahuja, 2006; Novak, & Hoffman, 1997). Flow resembles the notion of 'direct engagement' – the feeling of involvement directly with a world of objects (Hutchins, Hollan, & Norman, 1986).

Patrick Jordan's concept of physio-pleasure has a similar grounding (Jordan, 2000). P. Jordan's four types of pleasure in product use are rooted in anthropology and can be considered as dimensions by which to categorise the influence that UX has on interaction. P. Jordan's framework states that human factors and usability need to be considered to achieve good UX and also focuses on wider lifestyle issues. P. Jordan suggests that *socio-pleasures* involve enjoyment gained from social interaction and status, e.g. whether the product makes other people aware of the social group the user belongs to. *Physio-pleasures* include all aspects relating to the body, consider the physical constraints of the user and pleasure derived from senses, e.g. how well a camera would fit into user's hand. The adeptability of the product gives a qualitative sense of control. The *psycho-pleasure* relates to user's cognitive and emotional responses, e.g. how cognitively demanding the product is to use. *Ideo-pleasure* has some intersection with socio-pleasure but is in essence a reflection of personal tastes and values. P. Jordan's schema is a very useful tool for understanding user experience from a first-person perspective.

The *hedonic/pragmatic* model of UX assumes that people perceive interactive products along two different dimensions. Pragmatics refers to the product's perceived ability to support the achievement of *do-goals*, such as making a telephone call, finding a book in an online bookstore, or setting-up a webpage. In contrast, hedonics refers to the product's perceived ability to support the achievement of *be-goals*, such as being competent or being related to others (Hassenzahl, 2007). In this respect, they are similar to P. Jordan's socio- and ideo-pleasures. M. Hassenzahl is aware that experience is tied to usage therefore there is a difference between evaluating a product and using it; product perceptions are influenced by actual experiences. The hedonic/pragmatic model explicitly distinguishes three different facets of hedonics: *stimulation* (novelty and change, personal growth), *identification* (communication of identity to relevant others, relatedness) and *evo-*

cation (provoking memories, symbolizing). M. Hassenzahl admits that alternative lists of needs underlying hedonics have been proposed (Hassenzahl, 2007).

One of such lists worth mentioning is heuristics for designing enjoyable user interfaces (Malone, 1982). Malone discusses which features of video games make them captivating and enjoyable to play and proposes that enjoyable interfaces have three main qualities: challenge, fantasy and curiosity. First, an interface can *challenge* users by providing a clear goal, offering performance feedback, and providing uncertain outcomes. Second, an interface can appeal to users by providing an emotionally appealing *fantasy*. Finally, an enjoyable interface must appeal to users' innate sense of *curiosity* by providing an optimal level of information complexity. These heuristics apply specifically to the hedonic domain. However, John M. Carroll and John C. Thomas (1988) suggest that challenge, curiosity and fantasy should be used to facilitate fun in both hedonic and pragmatic domains.

Pleasure, fun and enjoyment are emotions, but the frameworks summarized before do not explicitly focus on emotional aspects of interaction. However, the term 'emotional design' has gained significant attention during the last decade (Norman, 2004). D. Norman connects UX with the generation of feelings by exploring the way users process information about products. He suggests that processing occurs at three levels: *visceral* (immediate and automatic), *behavioural* (related to functionality, performance and usability) and *reflective* (interpretation, understanding and reasoning based on previous experience). The user interprets an experience at all levels, but what appeals at one level may not appeal at another. For a product to generate a positive UX it has to excel at all levels.

Holistic approaches have contributed a number of frameworks describing how experience is formed, adapted, and communicated in social contexts. The best known among them are John McCarthy and Peter Wright's (2004) four threads of experience based in pragmatist philosophy. The *sensual* thread is concerned with our sensory engagement with a situation, it is "the palpable and visceral character of experience that is grasped pre-reflectively in the immediate sense of a situation" (McCarthy, & Wright, 2004, p. 80). The *emotional* thread refers to value judgements (e.g., frustration and satisfaction) that ascribe importance to other people and things with respect to our needs and desires. The *compositional* thread concerns the way that different elements of experience form a coherent whole. It refers to "the narrative structure, action possibility, plausibility, consequences and explanations of actions" (McCarthy, & Wright, 2004, p. 87). All experience has a spatio-temporal component, as space and time pervade our language of experience. The *spatio-temporal* thread draws attention to the quality and sense of this space-time. McCarthy and Wright pinpoint that while these are positioned as distinct components of experience they should be seen as intrinsically connected with each other.

J. McCarthy and P. Wright (2004) paid a great deal of attention to sense-making by decomposing it into six processes. *Anticipation* refers to users' expectations and imagined possibilities that are grounded in prior experience. In *connecting*, users make an instant judgment referring to the immediate, pre-conceptual and pre-linguistic sense of a situation. In *interpreting*, users work out what's going on and how they feel about it. In *reflecting* users examine and evaluate what is happe-

ning in an interaction and the feelings of frustration or pleasure that are part of the experience. In *appropriating*, users evaluate how the new experience relates to prior experiences, and in *recounting*, users communicate the experienced situation to others and reinterpret the experience as it participates in storytelling.

Jodi Forlizzi and Shannon Ford (2000) provided an early framework for understanding experience as it relates to user-product interactions. They created a systemic way to broadly talk about experience in three ways: *experience* (the purest form of reference, the constant stream that happens during moments of consciousness), *an experience* (type of experience has a beginning and an end, and can change the user, and sometimes the context), and *experience as story* (to condense, remember, and communicate experiences). They identified four modes of experiencing: sub-consciousness, cognition, narrative and storytelling. *Sub-consciousness* represents fluent experiences that do not compete for our attention, for example, routine activities or very usable products. *Cognition* represents experiences that require our attention, like interaction with an unfamiliar product. *Narrative* represents "experiences that have been formalized in the users' head: ones that force us to think about and formulate what we are doing and experiencing" (Forlizzi, & Ford, 2000 p. 422). *Storytelling* represents the subjective side of experience: "a person relays the salient parts of an experience to another, making the experience a personal story" (Forlizzi, & Ford, 2000 p. 422). J. Forlizzi and S. Ford argue that through this particular sense making users attach meaning and personal relevance to the situation. They subsequently identify ways of shifting across these four modes of experiencing. One might migrate from a cognitive to a sub-conscious experience, for instance, by learning how to use a product. Conversely, a fluent experience may shift to a cognitive experience if a user encounters something unexpected in his/her interaction with the product and is forced to think about it etc.

Sascha Mahlke and Manfred Thüring's (2007) CUE (Components of User Experience) model builds on the previous models and research findings. S. Mahlke and M. Thüring distinguish three UX components, which together determine the user's overall appraisal of a system and influence their future decisions and behaviour: perception of instrumental qualities, emotional reactions and perception of non-instrumental qualities. Instrumental qualities are related to the usability and usefulness of a system, while non-instrumental qualities are related to its appeal and attractiveness. S. Mahlke and M. Thüring acknowledge system properties, user characteristics and task/context. They also found empirical evidence that both aspects of quality influence emotional reactions and the appraisal of interactive systems.

TEMPORAL ASPECTS OF USER EXPERIENCE

In understanding how interaction shapes experience, time plays an important role. Nowadays with the advent of mobile use of systems, the importance of temporal and location based context in UX has grown significantly. Temporality

and situation of experience are more emphasised by the experiential approach to UX (Blythe, Overbeeke, Monk, & Wright, 2005). Until recently the temporality aspect of interaction was largely overlooked, and most of the classic usability and UX evaluation methods focused on single behavioural episodes and momentary evaluations (Karapanos, Zimmerman, Forlizzi, & Martens, 2009; Kujala, Roto, Väänänen-Vainio-Mattila, Karapanos, & Sinnelä, 2011). In a survey of 275 researchers and practitioners from academia and industry, most of them agreed that UX should be assessed while and after interacting with a product (Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009). However, UX can also be felt before interaction and it changes over time. Furthermore, the relative importance of different qualities can also change over time (Roto, Law, Vermeeren, & Hoonhout, 2011). As user's familiarity with a product increases, novelty wears off and the product becomes less exciting. At the same time, with prolonged use it can also become less frustrating. As a result, the perceived quality of a product is likely to change.

V. Roto (2007) suggests that a user has expectations before interaction. Brand image, other people's opinions, advertisements, test reports, and earlier experiences with similar products form the expectations. The expected UX plays a key role when the actual UX takes place, as the user will evaluate the actual UX against the expected UX. Furthermore, indirect experience extends beyond interaction, for example by reflecting on it or by getting new insights about the product.

When discussing or addressing UX, it is important to clarify the time span of UX that is in focus. At one extreme, it could be very briefly experienced visceral responses during usage (momentary UX). On the other, we could focus on cumulative experience formed through a series of usage episodes and periods of non-use, that might span months of usage, or longer (Roto, Law, Vermeeren, & Hoonhout, 2011). Reports on momentary UX can give information about the user's emotional responses to the interface, but longer time spans can give insights about the cumulative UX and total impact on overall evaluation.

Relationship between UX and usability

Even though both terms are often used interchangeably, thus adding to the confusion (Albert, & Tullis, 2013), in differentiating UX from usability it should be obvious that usability is an objectively measurable product attribute, quality of use in relation to a specific user and context. UX by contrast is a personal, subjective feeling about the product, a consequence, which is linked to the human emotions and attitudes that result from the interaction.

M. Hassenzahl offers three important distinctions between usability and UX. Holistic approach of UX aims for balance between pragmatic aspects and other non-task related (hedonic) aspects of product possession and use. UX is explicitly interested in the way people experience and judge products they use, assuming that these "subjective constructions" will guide future behaviour and will be com-

municated to others. The third distinction is the importance of positive outcomes of interaction as opposed to traditional usability focus on barriers, problems and frustration. M. Hassenzahl argues that it does not imply that usability is unessential but emphasizes that 'positive' does not necessarily equate with 'the absence of negative' (Hassenzahl, & Tractinsky, 2006).

Surveys conducted with practitioners and academicians suggest that usability and UX are seen as separate concepts by academics and practitioners alike, in contrast to earlier-voiced concerns (Law, Roto, Hassenzahl, Vermeeren, & Kor, 2009). However, all groups seem to have a more exact understanding of the concept of usability than of UX. This is not surprising, as usability principles have been applied for much longer, whereas definitions of UX still remain vague.

The relationship between usability and UX is mostly viewed from two different perspectives. Numerous usability studies (Nielsen, & Sano, 1995; Nielsen, Blatt, Bradford, & Brooks, 1994; Shackel, 1991) are the fundamental bases on which the field of UX is grounded. There is a strong perception that UX subsumes usability (Law, & Abrahão, 2014; Moczarny, Villiers, & Biljon, 2012; Nielsen, & Norman, 2012; Lallemand, Gronier, & Koenig, 2015; Law, & Van Schaik, 2010), rooted in the evidence that although lack of usability can lead to a negative UX, usability alone will not create a positive UX; it is merely a precondition. Under this point of view, UX includes usability. Another perspective sees UX as an extension of usability to accommodate fuzzy quality attributes such as emotion, enjoyment, and fun; as a form of user satisfaction dimension defined in a more refined way. In this viewpoint, usability includes UX. As a result, certain concepts, methods and tools have been "transferred" from usability to UX (Law, 2011). A third stance suggests that usability and UX are separate but closely-related concepts. They can be viewed as intersecting, with common attributes but also with certain distinct differences (Følstad, & Rolfsen, 2006; Law, 2011). The subjectivity of UX goals and their importance from the user's personal perspective are stressed as a contrast to the objectivity of usability goals, by which an interactive product is measured in terms of its usefulness and productivity (Rogers, Sharp, & Preece, 2011). Nigel Bevan (2009) indicates the varying roles of usability and UX, explaining that the difference in emphasis between task performance (usability) and pleasure (UX) leads to different concerns in the development process. It is increasingly recognized that a threshold level of usability is required for positive UX (Law, 2011; Hartmann, Angeli, & Sutcliffe, 2008).

At a higher level, usability and UX are both considered part of User-Centred Design (also called Human-Centred Design), which is defined as "an approach to interactive systems development that aims to make systems usable and useful" (ISO 9241-210, 2010). This process has been first formalized as an ISO standard in 1999 (ISO 13407, 1999) and was at that time only focused on usability. However, this major usability standard has been updated in 2010 for the UX era (ISO 9241-210, 2010) and now includes the concern for UX as one of the six key principles that will ensure that a design is user-centred.

Conclusion

The purpose of this study was to provide a brief overview of the emerging concept of UX and its components, covering different viewpoints and approaches. The study has identified the most significant theoretical frameworks and models that describe UX and emphasized the relevance of its temporal aspects.

Previous studies and literature highlight the need for a unique and general definition of UX. It is not a simple task due to fragmentation, complexity, variety of concepts and perspectives. However, most studies and authors agree that UX goes beyond the traditional usability by including the subjective feelings of the user and is dynamic and influenced by the context of interaction.

There are two basic approaches to theoretical frameworks and models studying UX. One is cognitive-science based and the other has its roots in phenomenology and pragmatist philosophy. UX aspects or dimensions can be summarized as pragmatic or instrumental (e.g. functionality, efficiency) and hedonic or non-instrumental (e.g. pleasure, enjoyment, stimulation). UX should be evaluated defining the time span that is in focus. While the UX during the actual interaction is considered the core, it is very important to pay attention to UX before, after and over time of usage.

The relationship between UX and usability has been addressed by different researchers. While most of them agree that usability is incorporated within UX, a number of studies see UX as an extension of one usability dimension – satisfaction. This distinction is meaningful both conceptually and methodologically.

From the work presented in this paper, further research opportunities related to UX can be identified. One major direction of study is metrics and methodology, both for UX evaluation and design. Further research could also usefully explore how UX changes over time; how co-experience impacts the expected UX; how to bridge a gap between perceived UX and actual UX; what are the relationships between the various UX components and product attributes; and the relative importance of usability factors in UX with different product types.

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