

User Experience: Challenges and Opportunities

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Abstract — User expectations, motivations and feelings when using a product or encountering a system have urged the need to investigate beyond the traditional functionality and usability concerns by assessing and designing for the user experience. Having this realized, we can ensure positive user experience as well as desirable products. This paper aims at providing an overview of the main concepts and principles related to user experience. The topics discussed in this paper cover both theories from the academia as well as empirical studies from the industry. Due to misconception of user experience, it was found that industry depends on and uses the traditional usability methods in the product development as user experience practices. As a result, this paper discusses and elaborates the relationship between conventional usability and user experience in addition to the variety of methods which can be used for user experience evaluation during different time spans. Furthermore, user experience extends over different areas such as human computer interaction, and product design and development. Knowledge and concepts related to user experience are scattered due to the dynamic concepts of user experience. In other words, authors tend to discuss the user experience from their own perspective and interest. Hence, this paper is trying to provide and establish a holistic understanding of the user experience by covering different topics related to user experience. The output of this paper may provide and assist researchers and practitioners to establish a base to aid in proper understanding of user experience, its concepts and principles.

Keywords – user experience; usability; user experience evaluation methods; user experience factors

1. INTRODUCTION

As stated in [1], there's a gap between the researchers from the academy and practitioners from the industry regarding the understanding of what user experience is and how user experience can be evaluated. User experience is dynamic and it involves multiple research areas such as human computer interaction, product design and development, psychology, etc. Several researches and studies were carried out. Some of these studies focused on specific topics related to user experience (e.g. Evaluation Methods) and some others tried to explain the meaning and scoping the user experience. In this paper, the authors present an overview for the previously conducted researches and studies including the theories from academia and empirical studies from industry. The aim of this paper is to provide an understanding of user experience concepts and principles by answering the questions below.

- What is user experience and how it relates to and differs from usability?
- Why user experience is challenging and what are the factors behind the diversion in user experience?
- How user experience relates to and differs from other experiences such brand or product experience?
- What are the different types of user experience evaluation methods?

From the literature review, user experience was found to be challenging and sometimes ambiguous. Basically, this is due to the way it is perceived and its dynamic nature and complexity. Accordingly, the work provided in this paper is trying to establish an understanding by getting familiar with user experience, its various aspects, and how it is perceived, exploring related issues and challenges as well as identifying and spotting the possible opportunities.

This is a conceptual paper and the method underlying this research is: (a) Exploring the rationale behind user experience (UX), (b) Investigating issues and challenges related to user experience, (c) Identifying the types of User Experience Evaluation Methods (UXEMs). This paper is organized into 6 sections. First section, provides an introduction to the work in this paper and a brief regarding the previous studies. Second section is about user experience (UX) and usability. In this section multiple user experience definitions were presented and the differences between user experience and usability were highlighted. Third section identifies the user experience challenges and the different perspectives in addition to user experience time spans in which user experience is evaluated and measured. Fourth section shows the reasons behind the diversion in user experience and elaborates these factors. It also differentiates and relates some concepts and terminologies in regards to user experience. Sixth section is about user experience evaluation methods (UXEMs). In

this section, evaluation methods were classified and explained. The last section in this paper is conclusion and recommendations which conclude and provide insight for practitioners and researchers towards further studies.

2. USER EXPERIENCE (UX) AND USABILITY

User experience (sometime UX for short) has been defined by many authors from both industry and academia. Below are some of these definitions.

- As in ISO 9241-110:2010 [27], user experience is defined as: “a person’s perceptions and responses that result from the use and/or anticipated use of a product, system or service”
- L. Alben [7], “All the aspects of how people use an interactive product: the way it feels in their hands, how well they understand how it works, how they feel about it while they are using it, how well it serves their purposes, and how well it fits into the entire context in which they are using it”.
- Hassenzahl and Tractinsky [2], “A consequence of a 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. organizational/social setting, meaningfulness of the activity, voluntariness of use, etc.)”.
- H. Jetter and J. Gerken [4], “UX incorporates not only the traditional qualities like reliability, functionality or usability but also novel and hard-to-grasp concepts from visual or industrial design, psychology or marketing research e.g., attractiveness, stimulation, fun, coolness, sexiness or the successful delivery of the brand proposition”.
- P. Desmet et al. [3], “The entire set of affects that is elicited by the interaction between a user and a product including the degree to which all our senses are gratified (aesthetic experience) the meanings we attach to the product (experience of meaning) and the feelings and emotions that are elicited (emotional experience)”.
- Nielsen [5], “All aspects of the end-user's interaction with the company, its services, and its products. The first requirement for an exemplary user experience is to meet the exact needs of the customer without fuss or bother. Next come simplicity and elegance that produce products that are a joy to own, a joy to use. True user experience goes far beyond giving customers what they say they want or providing checklist features”.
- V. Roto [6], “A term that describes user’s feelings towards a specific product, system, or object during and after interacting with it. Various aspects influence the feelings, such as user’s expectations, the conditions in which the interaction takes place and the system’s ability to serve user’s current needs”.

According to literature and due to the different views of user experience by different authors (e.g. different backgrounds and interests) as we have seen from the variety of user experience definitions, it is a difficult task to precisely define user-experience. From the diversity of user experience definitions, user experience goes beyond normal usability and functionality aspects of products by incorporating the users’ feelings and emotions towards these products before or during interaction.

As user experience tends to cover all behaviours, it apparently includes effectiveness and efficiency and this is in line with the designed methods by several practitioners who considered usability as part of the overall user experience [27, 28, 24]. Some researchers stated that user experience is entirely subjective e.g. “The objective measures such as task execution time and the number of clicks or errors are not valid measures for UX, but we need to understand how the user feels about the system.” [28]. As described by [29], UX and Usability relationship is interlaced; there were attempts to separate and release them on conceptual basis as well as operationally. Usability is counted by UX and as a result the proposition is that UX evaluation requires the extension of existing methods for usability evaluation. Usability tests are focusing on task performance while UX focuses on lived experiences [10]. UX is subjective [14], objective usability measurements like task execution time, number of clicks or number of errors are not considered enough measures for UX. That is why we need to know how users feel toward the system even though the subjective component of usability – satisfaction - can be considered as part or element of UX evaluation. UX also deal with a variety of other subjective qualities. User motivation and user expectations play stronger role in user experience than in the traditional usability [11].

User experience can be viewed in different ways as [24]: detailed satisfaction of usability [25], it differs from usability as it includes previous importance on user performance [8], and it can be seen as an umbrella-term that covers all perceptions and responses - regardless of being subjectively or objectively measured - of a user [26]. Apart from of the terminology, [24] stated that, there are two different objectives: to optimize the human performance and user satisfaction by achieving pragmatic as well as hedonic goals. And the methods used for realizing these goals will vary based on the product and design objectives. He also classified the methods to be used for user satisfaction optimization to achieve pragmatic and hedonic goals into three categories:

- To evaluate and design for the hedonic goals (i.e. stimulation, identification and evocation and associated emotional responses).
- To evaluate and design for the achievement of pragmatic goals.

- To support the design of the user’s experience by including “setting requirements” and understanding the “context of use”.

3. USER EXPERIENCE CHALLENGES AND TIME SPANS

As stated in [14], there are many reasons why it is difficult to have a universal or unique definition of UX:

- **Dynamic Concepts:** User experience is associated with a wide range of dynamic concepts which vary from emotional, affective, experiential, hedonic, to aesthetic variables [2]. Inclusion and exclusion of particular variables seem random and tightly dependent on the author’s background as well as interest.
- **Unit of analysis:** User experience’s unit of analysis is very flexible. It can be a single aspect of “an individual end-user” interaction with a “standalone application” or aspects of “multiple end-users” interactions with the “company and its merging of services from multiple disciplines” [30].
- **Fragmentation and Complexity:** The scene of UX research is fragment and complex by dissimilar theoretical models with diverse foci such as pragmatism, beauty, affect, experience, value, pleasure, emotion, hedonic quality, etc. [31, 3, 32, 33, 34, 35, 36].

Nevertheless, there are many critical uses of a UX definition, which tries to develop one meaningful in order to:

- Facilitate and ease scientific communication (e.g. between researchers with different backgrounds and from different disciplines).
- Help managing useful and practical applications of UX (e.g. operationalization and evaluation against measurements).
- Support the teaching of the concept and idea of UX with the basic understanding of its scope as well as its nature.

User experience can be viewed as phenomenon, field of study, or practice. These three perspectives were clarified by using the analogy health; medicine and doctor’s work respectively [9]. (Table 1) below shows the description regarding these different views.

TABLE 1: Different Perspectives of User Experience

Perspective	Description
UX as a phenomenon	Describing what UX is and what it is not
	Identifying the different types of UX
	Explaining the circumstances and consequences of UX
UX as a field of study	Studying the phenomenon (e.g. how experiences are formed or what a person experiences, expects to experience, or has experienced).
	Finding the means to design systems that enable particular UXs
	Investigating and developing UX design and assessment methods
UX as a practice	Envisioning UX (e.g. as part of a design practice)
	Representing UX (e.g. building a prototype to demonstrate and communicate the desired UX to others)
	Evaluating UX
	Delivering designs aimed at enabling a certain UX

User experience varies based on time, for this reason it is very important to highlight the time span on which user experience is evaluated and measured. The study in [14], has been conducted to gain understanding and views of "user experience". Participants of the study were 275 researchers and practitioners from academia as well as industry. The core user experience is the actual or real experience of usage. However user experience can be before, during, after or overtime of usage [9].

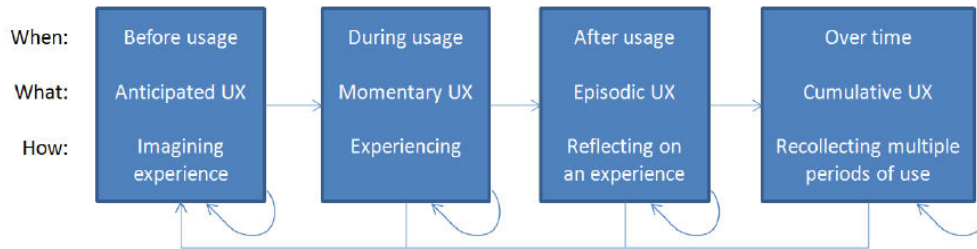


FIGURE 1: Time spans of user experience, [9]

- Before Usage (Anticipated UX):**
 Anticipations or expectations formed from related technologies, brand, advertisements, and other's opinions all these can affect on people and create an experience before the product is really used or actual interaction is encountered. Anticipated experience was found to extend or have an impact on consequent experiences (i.e. after usage) and usually this happens by reflecting on similar (previous) usage or due to change in people's view (intention) of use [9]. The study conducted in [14] has revealed that respondents from academia and industry agreed that "Prior exposure to an artifact shapes subsequent UX".
- During Usage (Momentary UX):**
 During usage experience or momentary refers to the user experience when user is interacting with the final product. Researchers has emphasized the need to assess and evaluate the user experience while users are interacting with product because of the dynamic internal state and context [14] and the specific change of feeling during interaction [9].
- After Usage (Episodic UX):**
 After usage or episodic user experience is the experience when user encounters with product for specific period of time.
- Overtime (Cumulative UX):**
 User experience overtime or cumulative experience is a result of a series of usage episodes as well as non-use. The duration of this experience might take months or longer. Cumulative user experience can be considered for viewing a system after being used for a while (i.e. appraisals of a system as a whole) [9]. It was found that industry is more interested in such long-term user experience, justifying that the overall product user experience is more important for people than temporary feelings when products are evaluated.

4. DIVERSION IN USER EXPERIENCE

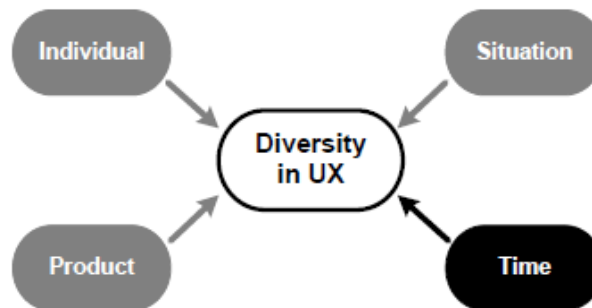


FIGURE 2: Sources of diversity in User Experience, [17]

According to [17], User experience along with its different aspects (e.g. pragmatic and hedonic) varies according to a number of factors: Individual, Product, Situation and Time [17]. Some others [9] used the terms: User, System and Context to indicate the user experience factors. [17] in their paper assumed that for a product to achieve positive user experience varies based on the previously mentioned factors (i.e. individual, product, situation and time). This assumption was made in contrast to Jordan [35] who suggested a hierarchy of qualities (functionality, usability and pleasure) that contribute to positive user experience. Jordan's hierarchy idea is similar to Maslow's hierarchy of needs, he assumed that a product should fulfill the pragmatic aspects (i.e. functionality and usability) before hedonic aspects (i.e. beauty and stimulation) are realized.

- Individual: Different qualities (e.g. useful, usable, enjoyment, pleasure, etc) for interactive product are moderated by (human values [23]) [22, 18]. As some people may prefer playful products, for others simplicity might be more favorable.
- Product: The type of the product do matter [21]. Being utilitarian or hedonic product will have an effect. For instance, in order for computer games to be successful it is vital to have playful interaction. However, the same quality (i.e. playful) may not be appropriate or necessary for utilitarian applications such as spreadsheet software which can be used for calculations and report generations.
- Situation: Situation of use has an important impact on different qualities (i.e. pragmatic or hedonic aspects) [19]. A clear example is the use of mobile phone when exploring ring-tones and making emergency call.
- Time: The perception of qualities for particular product changes over the time of use [37]. For example, when we get used to a product it will affect our perception of usability and similarly we may feel less excited towards it than the first moments of encounter. Furthermore, different qualities might be attached to a product during different phases of use.

To properly and precisely deal with user experience, it is necessary to distinguish “user experience” from the various types of “experiences” and point out how these experiences relate to or differ from user experience. Some researchers have made an attempt to clarify these concepts such as [14] and [9].

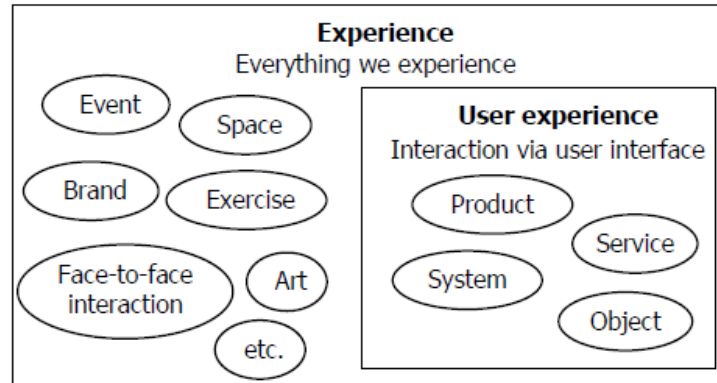


FIGURE 3: User Experience in relation to other experiences, [14]

- The verb *experiencing* refers to "an individual's stream of perceptions, interpretations of those perceptions, and resulting emotions during an encounter with a system" [9]. Usually people encounter with a system differently. Hence, it points out the “individual” and “dynamic” character of experiencing the encounter with a system.
- The noun *user experience* refers to "an encounter with a system that has a beginning and an end. It refers to an overall designation of how people have experienced (verb) a period of encountering a system" [9]. Not like "experiencing", "user experience" indicates the overall designation of the way and how people have experienced encountering a system for a period of time. Thus, it points out the "outcome" and "memories" of an experience instead of its dynamic nature. user experience can refer to individual as well as a group of people and not only emphasizing the individual nature like "experiencing".
- *Co-experience*, *shared experience*, and *group experience* refer to “situations in which experiences are interpreted as being situated and socially constructed” [9]. It is not only about encountering a system, in addition it focuses on people constructing and experiencing a situation together.
- *Brand experience* “includes not only interaction with the branded products, but interaction with the company, its products and services”. It is considered a broader concept than user experience. Information related to the company (from company, media, other people) will affect individual's brand experience and as a result brand experience may affect the user experience.
- *Product experience* is a term used by Desmet and Hekkert [3] to indicate the interaction with an artifact. Scope of product experience is narrower than user experience as it is not necessary for objects to be commercial products (e.g. self-made items) [14].
- *Service experience* “in a broad sense can refer to face-to-face services (e.g. in a restaurant or repair point), public services (e.g. roads), digital services on the Internet servers (e.g. gambling site), or anything in between”. Due to the multiple and different types of services, the term “user experience” should be used carefully. For example,

face-to-face services are not of the focus or interest of user experience as the interaction with humans is not via user interface, hence one cannot use humans. Therefore, it is recommended that “user experience” should be used with and scoped to products, systems, services or objects which a person interacts with via a user interface [14].

5. USER EXPERIENCE EVALUATION METHODS (UXEMs)

When it comes to "Evaluation of User Experience", it is to support and help in selecting the best design, to make sure the development is on right track, or to measure and assess whether the final product meets and comply with the original UX targets [13]. There is a need to enrich and have a holistic perspective of traditional usability models to include non-functional concepts such as joy, fun and pleasure. At the same time, literature review on experiential marketing has shown and stressed that a product should not only be considered as providing a set of functional features and benefits, instead it should provide experiences. In addition, customers take functional features, benefits, and product quality as a given. And end users (i.e. Customers) are looking for products "that dazzle their senses, touch their hearts and stimulate their minds" [38, 33].

A pointed difference between evaluation and design methods maybe sometimes is difficult to make [29]. Design methods usually called “inspirational” or “generative” methods and their objective is to bring inspiration for developers when they are developing or creating new products and designs [12]. The interest is in finding the ways to evaluate UX of current concept ideas, design details, prototypes, or final products. The primary focus of evaluation methods is to support and help in selecting the best design, to make sure that the development is on the right track, or to measure and assess whether the final product meets and comply with the original UX targets [13].

An important point is the perception of user experience when it is perceived by a designer and end user. When a designer designs a product, he or she "fabricates" product's attributes such as “interesting” and “useful” by putting together some features like content, functionality, and presentation and interaction style. These attributes are intended by the designer. However, it is not necessary for end user to perceive this product as “interesting” or “useful” the way the designer has done. That is why it is crucial to have better understanding of user experience, its determinants as well as the situation of interaction [34]. User experience evaluation will allow designers to understand and have an insight about how users perceive and value products. Having this understanding will ensure positive user experience and desirable products.

The table below describes and shows different types of user experience evaluation methods which are used in evaluating products. These methods are adapted from the user experience evaluation methods repository at (<http://uxems.shorturl.com>) which is a result of previous study [29].

TABLE 2: User Experience Evaluation Methods

Category	Evaluation Method	Brief Description
Study type	Field studies	Field studies are conducted in naturalistic settings, real contexts of use. Can be short-term (i.e. an hour) or long-term (i.e. 2 weeks).
	Lab studies	Laboratory studies are conducted in fixed locations (i.e. usability labs, meeting rooms).
	Online studies	Online studies are done via Internet. Participants can be anonymous or invited.
	Questionnaires / Scales	Questionnaires or scales can be used in various different types of UX studies such as experiential aspects.
Development phase	Scenarios, sketches; (i.e. concepts)	Important decisions affecting user experience are done in the early phases of product development, when the concept ideas are discussed. It is not possible to let participants really interact with the system, but the material may include storyboards, moodboards, scenarios, or design sketches.
	Early prototypes	Early prototypes may be interaction flow sketches on paper, Flash prototypes on a computer, or early version of the actual system with the core functionality. Early prototypes often include the core functions only, participants cannot freely explore the system but they are typically given tasks to evaluate.

	Functional prototypes	Functional prototypes provide most of the planned functionality and can be given for participants to test freely.
	Products on market	When evaluating products on market from UX perspective, researchers can approach people who have actually used the system from their free will. Considered the best setup for evaluating user experience. Also participants can be users who have not used the product before.
Studied period of experience	Before usage	Evaluate participants' perception of the system before they have interacted with it. The material for evaluation may include sketches or 3D models of industrial designs, graphics, storyboards, scenarios, etc.
	Snapshots during interaction	Evaluate momentary experiences while the participant is interacting with the system.
	An experience (of a task or activity)	Investigate an experience with a specific begin and an end. These methods can be used to find out how participants feel about the system after executing a task or after using the system for some activity.
	Long-term UX	Study user experience over a longer period use than one test session only. Examples of these methods include long-term field studies, retrospective evaluation sessions, and questionnaires.
Evaluator / Information provider	UX experts	Utilize the knowledge of user experience professionals in evaluating UX of the system. Compared to user studies, expert evaluation is often easier to arrange. Experts can also evaluate "difficult" material such as product specifications or early prototypes with many technical problems. Basic problems can be avoided by conducting an expert evaluation before a more expensive user study.
	One user at a time	Investigate the experience of a single user by using, for example, interview, questionnaire, or psycho physiological measurement methods.
	Groups of users	When the focus of the user experience study is on social aspects, it is interesting to study participants as a group instead of single participants.
	Pairs of users	Compared to discussions with a researcher, discussions with a friend may reveal very different perspective of user experience.

6. CONCLUSION AND RECOMMENDATIONS

According to the previous studies and literature review, it is not an easy task to have a unique and general definition for user experience due to the variety of concepts and the flexibility of adding and removing these concepts when stating a definition. This is because each of the authors comes out with a definition based on his or her background and interest (i.e. point of view). However, most studies and authors agreed that user experience goes beyond the traditional usability by including the feelings resulted from encountering a system or interacting with a product. User experience aspects or qualities were summarized as pragmatic (e.g. functionality, usability) and hedonic (e.g. pleasure, enjoyment, stimulation). The relationship between user experience and usability was clarified by different researchers. Most of those researchers agreed that usability is incorporated within user experience. Challenges related to user experience were also explained. Dynamic concepts, fragmentation and complexity of user experience research make it difficult to realize unique definition for user experience. In addition, user experience can be viewed from different perspective as phenomena, field of study and practice. Comparing the design methods and evaluation methods, the primary focus of evaluation methods is to support and help in selecting the best design, to make sure that the development is on the right track, or to measure and assess whether the final product meets and comply with the original UX targets. While the actual user experience is considered the core, it is very important to pay attention to user experience before, during, after and overtime of usage. As the user experience has an effect on subsequent experience. For example, anticipated user experience for a product (before usage) will have an effect on the momentary experience (during usage). Product attributes (useful or interesting) which are intended by the

designer, not necessary for end user to perceive them as the way designer has done. That is why it is crucial to have better understanding of user experience, its determinants as well as the situation of interaction to ensure positive user experience and desirable products. User experience and the perceived qualities or aspects (pragmatic and hedonic) were found to vary according to number of factors: product (system), individual (user), situation (context) and time. In regards to the relation with other experiences, it is recommended that “user experience” should be used with and scoped to products, systems, services or objects which a person interacts with via a user interface. Different evaluation methods were gathered and collected in previous study. The main objective of evaluating user experience is to support and help in selecting the best design, to make sure the development is on right track, or to measure and assess whether the final product meets and comply with the original UX targets.

From the work presented in this paper, further studies and opportunities related to user experience can be conducted and realized by academia and industry as well. For instance, it is essential for product success to undergo user experience evaluation before and during usage to ensure positive user experience and desirable product. In addition, industry needs to well-understand how user experience differs and relates to other concepts such as product and service experience in order to maximize the benefits gained from each of these concepts. For the evaluation of user experience, practitioners need to ensure the implemented practices are beyond conventional functionality and usability (i.e. pragmatic qualities) but also to include hedonistic aspects (i.e. pleasure, joy, etc). The perception of user experience as a phenomena or field of study allows researchers to investigate in and contribute to this field in a wide range of dimensions. For example, investigating and studying of user experience consequences and its impact on loyalty and trust. Furthermore, we need to study how user experience can ensure users retention when using products or services. Another pathway for undergoing user experience studies is the evaluation methods for user experience, according to the literature analysis, there’s a need to come out with robust yet simple tools and evaluation methods for measuring and assessing user experience throughout the different time spans.

REFERENCES

- [1] Kaisa Väänänen-Vainio-Mattila, Virpi Roto, Marc Hassenzahl (2008), *Towards Practical User Experience Evaluation Methods*. 5th COST294-MAUSE Open Workshop on Valid Useful User Experience Measurement (VUUM). Reykjavik, Island
- [2] Hassenzahl, M., & Tractinsky, N. (2006). *User Experience - a research agenda* [Editorial]. *Behavior & Information Technology*, 25(2), 91-97.
- [3] P. Desmet and P. Hekkert (2007), *Framework of product experience*, *International Journal of Design*, vol. 1, pp. 57-66.
- [4] H. Jetter and J. Gerken (2006), *A Simplified Model of User Experience for Practical Application*, pp. 106-111.
- [5] Nielsen-Norman Group, URL: <http://www.nngroup.com/about/userexperience.html>
- [6] V. Roto and E. Kaasinen (2008), *The second international workshop on mobile internet user experience*, pp. 571-573.
- [7] L. Alben (1996), *Quality of experience: defining the criteria for effective interaction design*, *interactions*, v.3 n.3, May/June, pp. 11-15, .
- [8] ISO DIS 9241-210:2010. *Ergonomics of human system interaction -Part 210: Human-centred design for interactive systems*(formerly known as 13407). International Standardization Organization (ISO). Switzerland.
- [9] Virpi Roto, Effie Law, Arnold Vermeeren, Jettie Hoonhout (2011), *Bringing clarity to the concept of user experience*, URL: www.allaboutux.org/files/UX-WhitePaper.pdf
- [10] Kaye, J. *Evaluating experience-focused HCI* (2007). In CHI '07 Extended Abstracts on Human Factors in Computing SystemsCHI '07. ACM, New York, NY, 1661-1664
- [11] Mäkelä A., Fulton Suri, J. (2001), *Supporting Users' Creativity: Design to Induce Pleasurable Experiences*. Proc. of the Int. Conf. on Affective Human Factors Design, pp. 387-394
- [12] Gaver, B., Dunne, T., and Pacenti, E. (1999) *Design: Cultural probes*. *Interactions*6, 1 (Jan. 1999), 21-29.
- [13] Stone, D., Jarrett, C., Woodroffe, M., and Minocha, S. (2005), *User Interface Design and Evaluation*(The Morgan Kaufmann Series in Interactive Technologies). Morgan Kaufmann.
- [14] Law, E., Roto, V., Hassenzahl, M., Vermeeren, A., and Kort, J. (2009), *Understanding, Scoping and Defining User eXperience: A Survey Approach*. Proc. CHI'09, ACM SIGCHI conference on Human Factors in Computing Systems.
- [15] Desmet. P. M. A.. & Hekkert. P. (2007). *Framework of product experience*. *International Journal of Design*. 1(1), 57-66.
- [16] Hassenzahl, M. & Sandweg, N. (2004). *From mental effort to perceived usability: Transforming experiences into summary assessments*. Proceedings of ACM CHI 2004, Extended Abstracts (pp. 1283-1286), 24-29 April 2004, Vienna, Austria.

- [17] Evangelos Karapanos, Marc Hassenzahl, Jean-Bernard Martens (2008), *User Experience Over Time*, CHI 2008, April 5 – April 10, 2008, Florence, Italy ACM 978-1-60558-012-8/08/04.
- [18] Desmet, P. M. A., Hekkert, P. and Hillen, M. G., *Values and Emotions*, in proceedings of Fifth European academy of design conference, Barcelona, Spain.
- [19] Hassenzahl, M. and Ullrich, D. (2007), *To do or not to do: Differences in user experience and retrospective judgements depending on the presence or absence of instrumental goals*, *Interacting with Computers*, pp. 429- 437.
- [20] Jordan, P. W. (2000), *Designing Pleasurable Products: An Introduction to New Human Factors*, Taylor & Francis, London.
- [21] Jordan, P. W. and Persson, S. (2007), *Exploring users' product constructs: how people think about different types of product*, *International Journal of CoCreation in Design and the Arts*, pp. 97-106.
- [22] Karapanos, E. and Martens, J.-B. (2007), *Characterizing the diversity in users' perceptions*, in C. Baranauskas, ed., *Human- Computer Interaction - INTERACT 2007*, Springer, pp. 515-518.
- [23] Schwartz, S. H. (1992), *Universals in the content and structure of values: theoretical advances and empirical tests in 20 countries.*, in M. P. Zanna, ed., *Advances in Experimental Psychology*, Academic Press, San Diego, CA, pp. 1-65.
- [24] Nigel Bevan, *What is the difference between the purpose of usability and user experience evaluation methods?*
- [25] Bevan, N. (2009) *Extending quality in use to provide a framework for usability measurement*. Proceedings of HCI International 2009, San Diego, California, USA
- [26] ISO FDIS 9241-210 (2009) *Human-centred design process for interactive systems*. ISO.
- [27] Ketola, P., Roto, V. (2008) *Exploring User Experience Measurement Needs*. 5th COST294-MAUSE Open Workshop on Valid Useful User Experience Measurement (VUUM). Reykjavik, Iceland.
- [28] Roto V., Obrist M., Väänänen-Vainio-Mattila K. (2009) *User Experience Evaluation Methods in Academic and Industrial Contexts*. Proceedings of UXEM 09 workshop.
- [29] Arnold P.O.S. Vermeeren, Effie Lai-Chong Law, Virpi Roto, Marianna Obrist, Jettie Hoonhout, Kaisa Väänänen-Vainio-Mattila (2010), *User experience evaluation methods: current state and development needs*, NordiCHI '10 Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries, Pages 521-530
- [30] Sward, D. (2006). *Gaining a competitive advantage through user experience design*. Online at: <http://www.intel.com/it/pdf/comp-adv-user-exp.pdf>
- [31] Cockton, G. (2008). *Putting Value into E-valuation*. In E. L-C. Law, E. T. Hvannberg, & C. Gilbert (Eds.), *Maturing usability: Quality in software, interaction and value* (pp. 287-317). London: Springer.
- [32] Forlizzi, J., & Ford, S. (2000). *The building blocks of experience: An early framework for interaction designers*. Proceedings of Designing Interactive Systems (DIS 2000), New York City, USA.
- [33] Hassenzahl, M. (2003). *The thing and I: understanding the relationship between user and product*. In M. Blythe, C. Overbeeke, A. F. Monk, & P. C. Wright (Eds.), *Funology: From Usability to Enjoyment* (pp. 31-42). Dordrecht: Kluwer.
- [34] Jordan, P.W. (2002). *Designing pleasurable products*. CRC Press.
- [35] McCarthy, J., & Wright, P.C. (2004). *Technology as experience*. MIT Press.
- [36] Tractinsky, N., Katz, A.S., & Ikar, D. (2000). *What is beautiful is usable*. *Interacting with Computers*, 13, 127-145.
- [37] Von Wilamowitz Moellendorff, M., Hassenzahl, M. and Platz, A., *Dynamics of user experience: How the perceived quality of mobile phones changes over time*, *User Experience - Towards a unified view*, Workshop at the 4th Nordic Conference on Human-Computer Interaction, 2006.
- [38] Schmitt, B.H. (1999). *Experiential marketing*. New York: Free Press.